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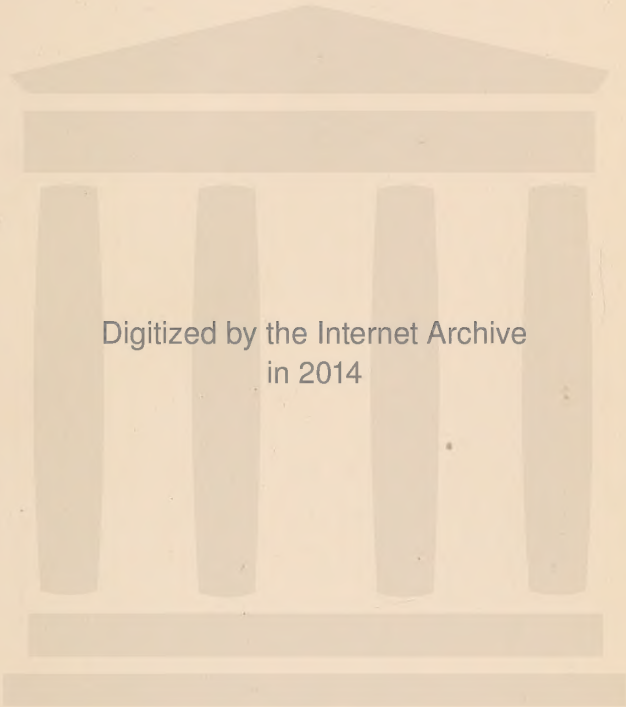
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TRANSACTIONS

OF THE

AMERICAN OTOLOGICAL SOCIETY.

1902-1904.

VOLUME VIII.

NEW BEDFORD:
MERCURY PUBLISHING COMPANY, 112 AND 114 UNION STREET.
1904.

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TRANSACTIONS

OF THE

AMERICAN OTOLOGICAL SOCIETY,

THIRTY-FIFTH ANNUAL MEETING.

PEQUOT HOUSE, NEW LONDON, CONN.

JULY 16, 1902.

VOL. VIII., PART I.

PUBLISHED BY THE SOCIETY:
MERCURY PUBLISHING COMPANY, PRINTERS,
NEW BEDFORD, MASS.
1902.

Extra copies may be had by addressing the secretary, Dr. F. L. Jack, 215 Beacon Street, Boston, Mass., or Mercury Publishing Company, 112 and 114 Union Street, New Bedford, Mass.

DR. CHARLES HENRY BURNETT.

In Memoriam.

By B. Alexander Randall, M. D.

Charles Henry Burnett, M. A., M. D., died of pneumonia at his home in Bryn Mawr, near Philadelphia, on January 30th, 1902. He was born in Philadelphia sixty years before, and there received his early education, but took his A. B. at Yale in 1864 and his degree in medicine at the University of Pennsylvania in 1867. He served as resident in the Episcopal Hospital, and then studied abroad for two years, working especially in otological lines, particularly with Helmholtz and Arnold. Some of the fruits of this he published in his "Investigations Concerning the Mechanism of Hearing and the Membrane of the Round Window," 1871, and "Investigation of the Membrana Tympani of the Mammalia," Am. Jr. Med. Sc., Jan., 1872. He devoted himself to the treatment of ear diseases on his return, and becoming a member of this society in 1872, was a frequent contributor to these Transactions and to the medical journals. His "Treatise on Diseases of the Ear" (Lea & Sons, Phila., 1877,) was encyclopedic in its summary of otological knowledge, and ten years later Dr. Roosa characterized it as "among the most valuable text books on the ear of the present day. The part upon anatomy and physiology is particularly well represented." He largely rewrote it for a new edition in 1884, and a dozen years later it was still placed at the head of many lists of recommended text-books. At the organization in 1883 of the Philadelphia Polyclinic he became Professor of Ear Diseases for five years, and was lecturer and later

Clinical Professor in this department in the Woman's Medical College. For thirty years aural surgeon to the Presbyterian Hospital, he was also consulting aurist to the Pennsylvania Deaf and Dumb Institution and to other institutions. He was a Fellow of the College of Physicians of Philadelphia, of the Philadelphia County Medical and the Pennsylvania State Medical Societies, and member and chairman in 1892 of the Section of Otology and Laryngology of the American Medical Association. He helped to organize and was for several years clerk and later chairman of the Section on Otology and Laryngology in the College of Physicians and was in 1878-82 Vice President and in 1883-5 President of the American Otological Society. Brief manuals on "Diseases and Injuries of the Ear" and on "Nursing of Ear Diseases" were followed in 1893 by a "System of Diseases of the Ear, Nose and Throat," edited by him, to which he contributed the chapter on Suppuration of the Middle Ear. His latest work in collaboration with Drs. Ingalls and Newcomb has given us an admirable brief manual of otology. For many years he wrote the abstracts of otological literature in the American Journal of the Medical Sciences, and in various year books, and was always a close student of current otology. Indeed, it was rather his characteristic to be an aggressive advocate of some of the newer views in otology, and he never hesitated to reverse his earlier judgments when he or others proved them untenable and to criticise vigorously whatever he disapproved. Of small physique and giving the impression of poor health, his trenchant criticism in discussion at times suggested acerbity of disposition; but all who knew him intimately bear witness to his punctilious courtesy and rectitude of purpose. He has been a real force in shaping otological knowledge and practice in America, and the profession in general as well as his colleagues in this Society has sustained a loss in his death.

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*Associates.

†Temporarily at Santa Barbara, California.

American Otological Society.

The Thirty-fifth Annual Meeting of the American Otological Society was held at the Pequot House, New London, Ct., Wednesday, July 16, 1902. The meeting was called to order at 10 a. m. by the President, Dr. Horace G. Miller.

The following members were present:

Drs. Joseph A. Andrews . . . . . New York, N. Y.
Gorham Bacon . . . . . New York, N. Y.
Charles N. Cox . . . . . Brooklyn, N. Y.
Wells P. Eagleton . . . . . Newark, N. J.
Edward Fridenberg . . . . . New York, N. Y.
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Philip Hammond . . . . . Boston, Mass.
N. Darrell Harvey . . . . . Providence, R. I.
N. J. Hepburn . . . . . NewYork, N. Y.
E. E. Holt . . . . . Portland, Me.
Lucien Howe . . . . . Buffalo, N. Y.
Frederick L. Jack . . . . . Boston, Mass.
Walter B. Johnson . . . . . Paterson, N. J.
Charles J. Kipp . . . . . Newark, N. J.
Herman Knapp . . . . . New York, N. Y.
Frank N. Lewis . . . . . New York, N. Y.
D. B. Lovell . . . . . Worcester, Mass.
George B. McAuliffe . . . . . New York, N. Y.
Jas. F. McKernon . . . . . New York, N. Y.
C. S. Merrill . . . . . Albany, N. Y.
Horace G. Miller . . . . . Providence, R. I.
Henry Lee Morse . . . . . Boston, Mass.
E. M. Plummer . . . . . Boston, Mass.
Thos. R. Pooley . . . . . New York N. Y.
J. S. Prout . . . . . Brooklyn, N. Y.

B. Alexander Randall	Philadelphia, Pa.
J. M. Ray	Louisville, Ky.
Henry O. Reik	Baltimore, Md.
Charles W. Richardson	Washington, D. C.
Stephen Olin Richey	Washington, D. C.
Henry W. Ring	New Haven, Ct.
J. D. Rushmore	Brooklyn, N. Y.
J. E. Sheppard	Brooklyn, N. Y.
F. B. Sprague	Providence, R. I.
S. B. St. John	Hartford, Conn.
J. Oscroft Tansley	New York, N. Y.
Samuel Theobald	Baltimore, Md.
F. M. Wilson	Bridgeport, Ct.
Hiram Woods	Baltimore, Md.

Drs. Green, Theobald and St. John were appointed as a Business Committee.

The Treasurer's report was read by Dr. Jack, and Dr. Morse was appointed as auditor thereof.

The Committee on Membership announced that it was not ready to report at this session.

The following gentlemen were invited by the Society to particpate in its deliberations:

Drs. Norris, Harlan, Hayden, Ard, and Wilson.

An appropriation of twenty-five dollars was made towards defraying the expenses of the International Medical Congress to be held at Madrid in 1903.

The appointment of a member on the Committee of Arrangements of the Congress of Physicians and Surgeons was referred to the Business Committee.

The Secretary presented a letter of resignation from Dr. W. B. Marple, which was accepted.

The following papers were presented:

I. Dr. J. Herbert Claiborne, New York, N. Y. Two Cases of Persistent Fistula after the Mastoid Operation, with remarks. (Read by title.)

II. Dr. H. O. Reik, Baltimore, Md. The Cardiac Effect of Operations on the Middle Ear.

Discussed by Drs. Randall, Bacon, Howe, and McAuliffe.

III. Dr. B. Alexander Randall, Philadelphia, Pa. Trauma in Relation to Exfoliation of the Adult Labyrinth.

Discussed by Drs. Tansley, Jack, Morse, and Sheppard.

IV. Dr. Samuel Theobald, Baltimore, Md. What Means, other than Operative, have we for Preventing and Combating Inflammation of the Mastoid Cells?

Discussed by Drs. Tansley, Richey, Gruening, Johnson, Wood, Randall, Holt, Bacon, McKernon, and Jack.

The Chair announced that the Treasurer's report had been audited and found correct.

Session adjourned.

Afternoon Session.

Meeting called to order at 2.30 o'clock by the President, Dr. Miller.

The Chair appointed a committee in accordance with the resolution introduced by Dr. Bacon to consider means by which this Society may hereafter secure more time for its annual meeting, consisting of Drs. Bacon, Gruening, and Morse.

The minutes of the morning meeting were read and approved.

The Business Committee, by Dr. Green, recommended that the reading of papers be limited to fifteen minutes, except with the consent of the Society to extend the time by vote, that the discussion be limited to five minutes, and that no member shall speak twice on the same subject, except by consent of the Society. On motion of Dr. Kipp the recommendation was adopted as a permanent rule.

Dr. Bacon, for the committee, reported that the committee recommends that there be a two-day session, on

the first and second days of the Congress, at Washington, and further recommends that in the future the sessions of this Society be arranged for two days at such place and time as may be agreed upon at the previous meeting.

The report and recommendations were adopted.

Dr. Bacon, for the Committee on Membership, asked for instructions as to the names of candidates carried over from last year, but whose names had not been given to the chairman of the committee.

On motion of Dr. Kipp the names left over were placed upon this year's list.

The following candidates for admission to the Society were nominated and referred to the Committee on Membership:

Dr. Joseph A. Kenefick, of New York, N. Y.
Proposed by Dr. T. R. Pooley. Seconded by Dr. Jas. F. McKernon.

Dr. W. B. Haskin, of New York, N. Y.
Proposed by Dr. N. J. Hepburn. Seconded by Dr. J. B. Clemens, Dr. T. P. Berens.

Dr. Richard Jordan, of New York, N. Y.
Proposed by Dr. H. Knapp. Seconded by Dr. T. R. Pooley.

Dr. Arnold Knapp, New York, N. Y.
Proposed by Dr. H. Knapp. Seconded by Dr. E. Gruening.

Dr. J. Scott Renner, of Buffalo, N. Y.
Proposed Dr. C. W. Richardson. Seconded by Dr. L. Howe.

Dr. W. H. Carhart, of New York, N. Y.
Proposed by Dr. D. Webster. Seconded by Dr. J. B. Emerson.

Dr. Sanders M. Pagne, of New York, N. Y.
Proposed by Dr. D. Webster. Seconded by Dr. N. J. Hepburn.

Dr. T. J. Harris, of New York, N. Y.
Proposed by Dr. J. B. Emerson. Seconded by Dr. N. J. Hepburn.

Dr. D. J. McDonald, of New York, N. Y.
Proposed by Dr. G. B. McAuliffe. Seconded by Dr. N. J. Hepburn.

Dr. E. L. Oatman, of New York, N. Y.
Proposed by Dr. N. J. Hepburn. Seconded by Dr. J. B. Emerson.

Dr. W. C. Phillips, of New York, N. Y.
Proposed by Dr. N. J. Hepburn. Seconded by Dr. J. F. McKernon.

Dr. Herbert Harlan, of Baltimore, Md.
Proposed by Dr. S. Theobald. Seconded by Dr. H. Woods.

Dr. A. B. Duel, of New York, N. Y.
Proposed by Dr. J. F. McKernon. Seconded by Dr. C. W. Richardson.

Dr. Gordon King, of New Orleans, La.
Proposed by Dr. A. W. DeRoaldes. Seconded by Dr. S. D. Risley, Dr. W. H. Carmalt.

The following list of officers for the ensuing year was presented by the Business Committee and passed.

President	Dr. B. Alex. Randall.
Vice President	Dr. William H. Carmalt.
Secretary and Treasurer	Dr. Frederick L. Jack.
Delegates to Congress of American Physicians and Surgeons . . .	Dr. W. H. Carmalt. Dr. F. B. Loring.

Members of Committee of Arrangements to be appointed by the President.

Committee on Membership	Dr. Gorham Bacom, Dr. B. Alex. Randall, Dr. J. S. Prout.
Committee on Publication . . .	Dr. Clarence J. Blake, Dr. J. Orne Green. (The Secretary *ex-officio*.)

The report was accepted and the Chair instructed to cast the ballot.

The reading of papers was resumed as follows:

V. Dr. Charles J. Kipp, Newark, N. J. A Case of Sarcoma of the Temporal Bone.

Discussed by Drs. Friedenburg, Randall, Johnson, and Abbott.

VI. Dr. Thomas R. Pooley, New York, N. Y. Some Observations on Stacke's Operation.

Discussed by Dr. Randall.

VII. Dr. E. Gruening, New York, N. Y. Remarks on Thrombosis of the Sigmoid Sinus, with Three New Cases.

Discussed by Drs. Green, Kipp, McKernon, Bacon, Randall, Holt, and Andrews.

VIII. Dr. B. Lovell, Worcester, Mass. Thrombosis or the Superior Longitudinal Sinus.

IX. Dr. Herman Knapp, New York, N. Y. A Case of Progressive Deafness. Intermittent Right Hemiplegia with Sensory Aphasia. Letter–, but not Word–Blindness.

X. Dr. George B. McAuliffe, New York, N. Y. Observations on Anaesthesia of the Drum Membrane.

XI. Dr. Frederick L. Jack, Boston, Mass. Supplementary Report on a Case of Double Stapedectomy Operated Upon Ten Years Ago.

Discussed by Dr. Johnson.

XII. Drs. Edward B. Dench and Frank M. Cunningham. The Value of Bacteriological Examination of the Discharge in Acute Otitis Media as Determining the Necessity of Operative Interference.

XIII. D. J. O. Tansley, New York, N. Y. A Piece of Bougie in the Eustachian Tube.

Adjourned.

FREDERICK L. JACK,
Secretary.

TWO CASES OF PERSISTENT FISTULA AFTER THE MASTOID OPERATION, WITH REMARKS.*

By J. Herbert Claiborne, M. D., *New York, N. Y.*

Case I. A young Irish woman of 26 years of age, consulted me March 23d, 1901, through Dr. Eversfield, of New York, on account of her left ear. She was a saleswoman in a large department shop. She had had grip in January and since that time had not felt well. When she came to me she presented a pitiable spectacle. Her hand was over her left ear, her face was drawn, pale and pinched and she had the typical appearance of one in great pain and suffering from profound systematic intoxication. She was so deaf she could hear only shouting speech. The ear stood off from the head, the mastoid was swollen, oedematous and tender on pressure, particularly over the region of the antrum, the temperature was 101.8°. The left drumhead was hidden by the presence of a quantity of moist epithelial scales. There was no odor, nor was there any swelling of the canal in the region of the membrane. The fact that she was apparently deaf in both ears, induced me to examine the right ear also. I found there a dull, somewhat sunken membrane, but nothing else beyond a slight redness along the hammer and at the periphery. There was no swelling behind the ear, but it appeared to be tender on pressure. I finally satisfied myself that the tenderness behind this ear was not a true one, and that her recoiling under pressure was due to her nervous and apprehensive state. Subsequent

*Read by title.

examination of that ear showed a markedly diminished hearing power. She admitted that she had had bad hearing on that side since her childhood, although her hearing at the time was undoubtedly lessened by her then condition, as subsequent examination showed. She was sent to the New Amsterdam Eye and Ear Hospital and put to bed. A large dose of Epsom salts was administered, hot douches were made to the ear and an ice-bag placed over the mastoid. A quarter of a grain of morphine, hypodermically was administered at 11 p. m. After a restless night her temperature was found to be 104°. It was decided to operate as soon as possible and at 2.30 o'clock on that day the patient was anaesthetized. The classical mastoid incision was made. The outer table of bone appeared to be healthy, but the chisel found its way readily beneath it. No pus was found, but a quantity of granulation tissue was evacuated. The tip was not entirely removed, since in that region the bone appeared to be healthier than elsewhere. The granulation tissue having been all apparently removed, Dr. Pooley, who assisted me, and myself decided that there was no frank indication for entering the antrum. Accordingly the wound was packed with iodoformized gauze, and the patient put to bed. The temperature immediately fell to 100°, but the next morning rose to 103°. At that time there was absolutely total deafness on both sides, she being unable to hear anything whatsoever. She vomited, was restless and appeared very apprehensive. I saw her the first time on Saturday and operated for the first time on Sunday. On the following Monday afternoon the above symptoms were exaggerated, if possible, and I decided upon a second and more extensive operation. Dr. Myles and Dr. Pooley gave me their valuable assistance, and the patient was chloroformed at ten o'clock Monday night.

The original wound was considerably enlarged, the entire tip was removed, and a skin flap was produced by an incision extending downward and backward, commencing on the hair line and on a level with the upper border of the concha. This was for the purpose of seeking dead bone and possibly a fistulous opening into the posterior cranial cavity. Small beads of pus were found at the apex of the tip and in fact throughout the new area invaded. With rongeur forceps the bone was bitten away to the rear and above and it was observed that the cancellous tissue extended much farther than ordinarily. In fact, it was found far beyond the region of the sinus and well up into the squamous portion of the temporal bone; wherever there was cancellous tissue, there were beads of pus. The antrum was entered by a large aperture, but that cavity and the middle ear were not made into one. There was no pus in the antrum. Since the bone which lay immediately over the sinus was healthy, and since there had been no tenderness over the jugular vein, it was decided not to invade these structures. The antrum and the wound were packed with gauze and the patient put to bed. The temperature fell that night and on the following morning was still down, but she developed a hacking cough on that day and towards the afternoon the fever rose again. Examination of the chest revealed a patch of solidification of the lung, of the size of the palm of the hand, on the right side. There was a difference of opinion as to whether or not this was metastatic; it was the opinion of Dr. Pooley and myself that the pneumonitis was incidental. Antiphlogistine, in the shape of a paste, was applied to the area, and on the following day, Wednesday, there was prompt resolution, with characteristic brick-dust in the sputum. There was no swelling of any of the joints, though she did complain of pain in the knees.

After this the temperature went to normal and stayed there. On the following day, that is, Thursday, the hearing commenced to improve. The patient's appetite recovered, and her general physical condition went on to complete recovery. The wound healed very slowly, which was natural in view of the large quantity of bone removed. At one time a pocket of pus was discovered at the lower angle of the wound and far under the skin flap. This was indicated primarily by a rise of temperature which became normal again after evacuation of the pus. There was also discovered subsequently a small spiculum of dead bone at the lower angle. This was removed and the wound healed more rapidly in that direction afterwards. About five weeks following the operation, she left the hospital for her home. The angles of the wound were well healed, but there was still a cavity leading toward the antrum. She came to my office on regular days for six weeks thereafter for the wound to be dressed. At the end of this time it had apparently healed well-nigh to the surface, so I permitted her to go to work. She performed her duties without any discomfort, but after she had been at work a month or more, I noticed one day a drop of pus at the bottom of the wound. I thrust firmly upon the region with my probe, and to my surprise it burst through a thin crust of tissue and disappeared in a cavity to a considerable distance. The patient became immediately pale, nauseated and exceedingly deaf. Subsequent manipulation convinced me that the cavity led directly into the attic. This incident happened about four and a half months after the second operation. The bony wound since that time has made a number of attempts to heal on the surface, but this has been prevented by the use of gauze packing. Subsequently I inserted a small perforated silver style. She wears that today, seventeen months after the operation. The mastoid region is gradually fill-

ing up with a deposit of bone cells, and is commencing to assume a rotundity approximately normal. The fistula is at the bottom of a sulcus bounded by firm, hard bone, and it is possible to observe a narrowing of this sulcus with the march of time. The aperture is surrounded by an area of pale, soft flesh, which could be easily broken down. I, however, simply keep the style in position and swab out the fistula every day with absolute alcohol. A number of times the alcohol has permeated into the throat through the Eustachian canal, causing great pain in the ear. A singular accident happened during the conduct of this case. On one occasion I was swabbing out the fistula with a cotton-armed probe when the cotton came off and remained in the depth of the fistula. An attempt to remove it pushed it further in. I was in some trepidation as to the result. The middle ear, however, as shown in the appearance of the drumhead subsequently, and at that time, was not affected, nor was the hearing, and in the course of several weeks, after a profuse suppuration, the cotton was discovered at the mouth of the fistula, and was promptly removed. The fistula has been at all times free from stinking pus, the discharge being slight and watery in character. I have at no time been able to feel any rough surface at the bottom or on the sides of the fistula, and hence, have been led to conclude that there is no sequestrum of dead bone present.

The status of the patient as to the hearing power at this date, is the following: The tuning-fork held in the median line of the skull is heard best in the left or operated ear. In this ear the watch with a fine tick is heard at 3 1-2 feet: the finest whisper is heard easily in the vicinity of the ear. There is no difficulty whatsoever in hearing ordinary conversation. The drum-head is sunken, the handle of the hammer slightly red, and the attic distinctly red. Reflex totally absent. In the right ear, the

drum is sunken, pale grey, no redness, no swelling. Hears very loud whisper in immediate vicinity of the ear. She relies entirely for accuracy of hearing on the left or operated ear.

Case II. A young man of 23, hotel clerk, extraordinarily well built, and healthy, contracted inflammation of left ear during the latter part of the past summer, while bathing. He received no treatment, but the ear recovered in the main, albeit somewhat uncomfortable thereafter. During the early part of the following December his ear became very painful and he grew very deaf. He was sent to me by Dr. Thayer Adams, of New York. When I saw him I found the drumhead red, slightly swollen, and the hammer could be easily made out. He complained of loud noises in that ear. There was neither tenderness nor swelling over the mastoid. I ordered hot douches and a full dose of Epsom salts. On the following morning the drum was ruptured and when I saw him there was a copious discharge of pus. There was relief from pain, though the noise and tenderness remained. At the end of two months the drumhead had healed and become almost normal in appearance. The hearing power had increased, but the tinitus remained. Against advice he discontinued treatment. In three weeks he returned with the statement that he had contracted a fresh cold. I found an immense swelling over the mastoid, the pointing behind and slightly to the rear of the mastoid tip. The ear stood off from the head and there was great pain in the ear and throughout the left side of the head radiating down the neck; temperature 101°. The drumhead was swollen, the outlines of the hammer being entirely obliterated. I diagnosed mastoid disease with subperiosteal pus and advised immediate operation. The mastoid incision was made under ether, and when the periosteum was reflected, two table-spoon-

fuls of odorless pus were evacuated in the neighborhood of the greatest swelling. The outer table of bone was found to be healthy. The entrance into the subcutaneous bony tissues was made by an opening that was a trifle higher than the ordinary one. The mastoid region was explored and a small quantity of granulation tissue was removed. The tip was spared on account of its healthy appearance. The antrum was, however, entered by a large opening; no pus was found there. It appeared, in fact, after all granulation tissue had been cleared away that the subperiosteal pus was the main, if not the sole cause of the existing serious symptoms. The character of the bony surface under the seat of the pus was determined by the introduction of the little finger. Neither Dr. Pooley nor myself were able to find any indication of roughness. We, therefore, saw no reason for further exploration in this region. The antrum was tightly packed with iodoformized gauze and the surface wound was dressed in the usual style. The temperature fell immediately to normal, and the patient expressed himself the same evening as feeling as well as he ever did. The hearing immediately improved and the tinnitus was considerably diminished. The wound healed at the angles in 48 hours and commenced to granulate from the bottom. The patient left the hospital in six weeks, while the bony wound was still deep. He went to his home, where he remained quietly in his room. He came to my office every other day to have his wound dressed. The bony cavity, in the meantime, was healing slowly, if at all, and at the end of three months from the date of the operation, he went to work in the office of the Waldorf, where he did duty as night clerk. The wound at this time while entirely healed at the angles, consisted of a fistula three-quarters of an inch in depth. There was some granulation tissue in it, but no

discharge of pus, occasionally a drop or two being found at the bottom by inspections of the hand mirror. The probe introduced into this cavity went, without doubt, into the attic. I was accustomed to pack the wound tightly at the bottom with gauze. But it finally occurred to me that this might have some bearing upon the slowness of the healing process. I therefore ceased packing it to the bottom, and saw my patient every four days. I was astonished to find immediately after this change of treatment that the wound was less deep and that the whole appearance gave promise of more rapid healing. This took place four and a half months after the operation. On the 12th of June the wound measured one-quarter of an inch in depth and the healing process was progressing rapidly, as shown not only by the shallowness of the fistula, but also by the smallness of the aperture. At the end of June the wound had healed firmly and compactly, and I found the following condition on examination: The drumhead somewhat sunken, but the handle of the hammer red, Shrapnell's membrane red, and the canal in its immediate vicinity, also red. There was no reflex. The watch was heard at two feet, finest whisper in the immediate vicinity of the ear, acoumeter at 20 feet. The noises had disappeared entirely excepting when the patient went to bed when they could be slightly heard.

I fancy there are few within the sound of my voice who have not at some time within their career seen a persistent fistula following an operation upon the mastoid. I have brought the two cases just detailed before you in order that they may serve as a possible text for the discussion of the causes of fistula following operations upon the bony structures of this region. At the first blush, one naturally lays the condition to the presence of dead bone, but there are cases in which this cause cannot with reason, be given :

to wit, those cases in which the outer skin grows far down into the fistula which not only do not present the pus-flow natural to dead bone, but are even totally dry.

The second case, that of the young man, was obviously not a case of caries or pus of the inner mastoid region. The pus was altogether superficial and only a very small amount of granulation tissue was found in the mastoid cells. It is true however, that anteriorly there had been pus in the middle ear. It is not reasonable, in my opinion, to look to a sequestrum for the cause in this case. I do not adduce it as a cause even, but I remark it, that the opening into the bone was made a trifle higher than ordinary in the Schwartze incision. This is my custom. I find that the route to the antrum is more direct when the entrance is made higher than ordinarily. The patient remained in the hospital six weeks, being permitted to sit up and move about his room at the end of two weeks. Upon leaving the hospital and going to his home, he lived much the same life he lived in the hospital, save when he came to my office to be treated. During all this time there was a deep opening in the bone. I think nothing is so well established in medicine as that the bed is the best place for those who are ill or wounded. Nature certainly repairs an injury more rapidly and effectually when the organ invaded is at rest. The flesh wounds healed very rapidly, but the bone slowly, in my two cases. The repair of bone is naturally slower than that of the soft parts. The young man becoming disgusted at the slowness of his recovery, finally went to work and remained standing on his feet and moving about constantly for twelve hours in the day. Added to this, he did the duty of a night clerk. No improvement was noticed at all until I ceased packing the wound to the bottom. Whether the result was an illustration of the principle of *post-hoc* or that of *propter-hoc*, I do not know, but I record the fact. It is fair to as-

sume that the pressure upon the tender new cells retarded or assisted in retarding their growth. Reasonably then, I can bring forward two things which have a possible bearing upon the persistent fistula in the young man's case: First, too much moving about and the *dorsal decubitus* for an insufficient length of time after the operation; Second, tight packing of the bottom of the wound.

The young Irish girl left the hospital while the bony wound was still quite deep, and finally went to work at her arduous duties in the department shop, in practically the same condition. This certainly was not conducive to the healing of the bony wound; but the behavior in this case and its general history leads one to lay the permanent fistula to the existence of dead bone. The probe, however, has given no evidence of it and the pus has always been watery and scant. Only granulations have been found at the bottom of it. My surgical instinct leads me to curette the fistula thoroughly,—to remove all granulations and scrape the bony walls in search of dead bone. Against this are the perfect health of the patient, the excellence of the hearing, the exigencies of her life, the possibility that after all there may not be any dead bone, the possible loss of time, now gained, and interference with Nature in her plan of cure. Cases like this one certainly present considerable interest. Here is a cavity in a bone which has two means of drainage,–through the mastoid opening or through the attic by way of the middle ear and Eustachian canal. The pus, following the line of least resistance, selects the easier route, that is, through the fistula. I believe, on general principles, it is sound surgery not to pack the fistula too tight or at the bottom. It may be left open entirely or a perforated style may be inserted for drainage. The granulations may be treated by the use of absolute alcohol. Before us, then, in this

case, as in others that are similar, lie two procedures: repeated surgical interference by curetting or the expectant treatment by the perforated canula and the treatment of the granulations. Which is the better?

TRAUMA IN RELATION TO EXFOLIATION OF THE ADULT LABYRINTH.

By B. Alexander Randall, M. A., M. D., *Philadelphia, Pa.*

Among the many cases of labyrinth-exfoliation which have been put on record it was to me a considerable surprise to find how few were in adults, especially of those in which more than some fragment of the cochlea came away. My attention was called to the matter by a case of which some details may be of interest. A man of fifty-five, of massive build and active habits, with sugar occasionally in his urine yet generally absent under slight dieting, but who never had excessive thirst or polyuria, was in a railroad wreck in which many were killed or maimed around him. He heard only some breaking of glass, then found himself in darkness on the floor of the coach and on clambering out unaided found that the most or all of the killed or injured had been already removed. He was unconscious, therefore, for an unknown time and found the temporal region above the left ear abraided, bleeding, and exquisitely tender. Various lotions were used for a week or more before pressure became bearable; and five or six days after the injury a renewed extravasation came to view. There was no paresis, no bleeding from the ear and no loss of hearing seems to have been noted; but dizziness was continuous, he had to adopt a cane in walking, felt unable to drive his team and incompetent to manage his affairs. Yet he told most people that he had escaped injury in the wreck and seems to have had no thought of damages, although frequently under medical care.

About eight months later he had on the street a severe throe of pain in the left ear and suffered severely for several days before discharge from the ear showed the real seat of trouble. Although assured that the pain was not dental, he had one or more teeth drawn, believing them at fault. No relief was obtained for months by local medication; but a facial paralysis occurring in the second week rapidly disappeared. No note of deafness was made by him or his attendants. Still suffering severely he was after six months of discharge admitted to a hospital and his mastoid chiselled. The operation was probably superficial, was repeated within three weeks, but even then without immediate securing of through and through irrigation, still less any exenteration of the tympanum. The operator claimed that he opened the antrum and that no loose bone was left—also that he would not have been justified in removing bone which was not loose. The suffering continued extreme, the vertigo at times caused falls and the fistulous opening over the mastoid led down to bare bone. Several months later he consulted Dr. Keen, to whom he had been originally recommended, who advised some further delay. He delayed for nearly six months, at which time he consulted me as well as others, receiving on all sides the advice that operation be promptly done. I found the ear totally deaf, discharging freely through the canal and with granulations concealing all details within the tympanum. A sinus up and back in the middle of the mastoid wound led inward and forward a depth of an inch from the surface to a considerable sequestrum with little mobility; and I advised him that operation would have to go to the dura and might be extensive within the cranial cavity. He returned to Dr. Keen, who operated two days later and removed a smooth, rounded, white sequestrum comprising most of the vestibule and semi-circular canals which was lying loose in contact with

the dura. Necrotic bone lay external to it which had to be extensively removed before the sequestrum could be extracted. Facial palsy immediately supervened and has persisted unchanged; but the mastoid wound healed promptly, the relief from his torturing pain was immediate and only slight discharge, some vertigo and greatly lessened disability has remained. I should add that at a later visit I found the ear still suppurating and with a considerable sequestrum impacted in the tympanum so that it could not be removed until broken in two. This shows itself to be the lower anterior portion of the first cochleal turn, but without markings of the curve of the carotoid. The extent and character of the sequestrum raised a question of the responsibility of the railroad injury for the later-coming affection, and the case went to Court, where a verdict of substantial damages was given for the plaintiff.

A new trial was granted on the ground of additional evidence and at the second trial I was called as an expert witness. I had been quite skeptical at the time of my first examination of him as to any relation of the railroad injury to his middle-ear suppuration, which seemed distinctly Grippal and had been eight months delayed. Examination of the sequestrum, however showed almost no sign of carious surfaces and while stony hard it was rounded like a pebble from the brook by the long action of granulation tissues. This made plausible the view that a fissure of the petrous portion of the temporal bone anterior to the auditory apparatus had furnished an entrance point for the deeper penetration of the suppurative process and had facilitated the separation of the labyrinthine sequestrum.

Study of the recorded cases of labyrinth-exfoliation showed that most of these have been due to involvement of the promontory and the fragment removed has been almost solely cochleal. Most of the subjects have been children and the occurence of such exfoliation in the adult

except as the result of constitutional disease, such as tuberculosis, has been rare ; and I was struck by the finding that the most parellel cases of such disease in the adult have a clear traumatic history and furthermore that the onset of severe ear-symptoms had invariably been delayed for a period of from eight to twenty months. In going upon the witness-stand I was, therefore, in a position to say not merely that the contention of the plaintiff was plausible in connecting his subsequent disease with the railroad injury, but that it afforded the most probable explanation of the pathological finding. The probability or even the possibility of such a relation was of course vigorously contested by surgeons on behalf of the Railway Company ; but they were compelled to admit that a blow upon the ear causing unconsciousness and severe contusion, with delayed appearance of blood-staining from the deeper parts, and followed by persistence of vertigo and disability from the time of the injury were compatible with the idea of a transverse fracture of the pyramid internal to the labyrinth, and that such a fissure might have remained without other symptoms. The claim that the sequestrum was not present at the operations ten months before its removal cannot stand as incontestible, since the operations were manifestly superficial, and the sequestrum was shut in even ten months later by much carious bone which hardly gave access to it and had to be removed before it could be withdrawn. The absence of evidence of any recent caries upon its polished surfaces proves that a long time (probably more than a year) had elapsed since it had been separated from its attachments. That no cleavage plane was recognizably present after sixteen months of suppuration is hardly surprising ; and the finding of the court that the plaintiff was entitled to damages seems to me fully justified by surgical and pathological considerations.

In the summary of cases of necrosis of the labyrinth brought together by Bezold in his admirable paper, (Archives of Otology, Vol. XVI. p. 297) only 46 cases are gathered and of these the minority were of adult age; and he makes the statement that above 55 years of age there is no such case on record. Such a case was, however, reported by Bezold himself a little later, yet this illustrates the infrequency of such occurrences after middle life. Without citing the statistics given in tabular form, it is well to refer to such cases as parellel in any notable degree that which I have just outlined and of these one of the most notable is that reported by Schotti: "A robust country-man, 45 years old, fell from a ladder, causing a marked contusion on the left side of his head; he was unconscious but soon recovered without medical care and appeared after a short time fully sound. First after two years deafness was noted on the left and a sense of stoppage with occasional removal of blood, pus and particles of bone. Thereafter two to three times a year severe headaches and fever followed. Six years after the injury facial palsy appeared and became slowly complete. Three months later, pain, fever, and mastoid abscess. Various bone fragments were extracted including one 10 by 5 mm. showing portions of cochlea and semicircular canals, also the tip of the petrous pyramid. Prompt healing ensued but with total deafness and hemianesthesia of the face." Schmidt's Jahrbuch CII. 54, '59, (Gazz. Lombard. No. 35, 1858). A second case, the fifth of Bezold's series, was a woman of 39 who had suffered otorrhoea after scarlet fever in her eighth year with abscess breaking behind the ear in her 20th year, recurring in her 36th and three years later a large sequestrum including the entire labyrinth 19.5 mm. long by 13.5 by 7.5 with smooth, polished outer surfaces was removed with a hair-pin. As in the patient I have just reported

the sequestrum was polished by the long-continued action of the granulations; and Bezold cites Volkmann's as well as his own experience to indicate that mere pus will not erode a sequestrum and that the smooth, bony mass had probably been many years present in the temporal region. This patient died shortly after of intra-cranial extension of her carious process, as recorded in Bezold's second paper. Another interesting case is that reported by Shapleigh in the American Journal of Medical Sciences for May, 1890, p. 456, where a negro aged 39 was found to have abscess in the cerebellum and occipital lobe with the scar of an injury by the blow of an axe fifteen years before on the mastoid region. He had been rendered unconscious for a few minutes by the blow and regaining consciousness soon fainted from loss of blood, but seemed entirely recovered in three weeks and remained well for nine or ten months. Then he began to suffer with headaches which were relieved by the escape of pus from the mastoid wound. Similar attacks occurred about every two years except that eight years before pus had begun to come from the ear instead of from the mastoid wound. A scar above the left ear extended down and back four inches and the auditory canal was closed at a depth of half an inch—the culdesac being lined with nearly normal skin throughout and the needle exploring it meeting firm bone in all directions. The jaw could hardly be moved and the facial nerve was completely paralyzed. These conditions dated back to the injury fifteen years before. There was no hearing on this side and the patient stated he had not heard with that ear since the blow. Vertigo was present in a moderate degree and the intellect seemed clear.

Operation was unavailing and the patient died in ten hours. The examination of the temporal bone showed fracture and displacement downward and forward of almost all of the mastoid process, with firm fibrous tissues

fastening it in its new position and with other bands forming a fibrous ankylosis of the jaw. The petrous portion of the temporal bone was the seat of extensive necrosis which had almost completely enucleated the bony capsule of the labyrinth—the lower surface alone still maintaining its attachment to the pyramid. Necrosis was most marked in the softer bone of the outer side of the labyrinth where quite a cavity had been formed communicating with the posterior surface of the petrous portion at about the site of the aquaeductus vestibuli. The whole labyrinth-mass was riddled with caries and yet firmly held in place by bony attachments below. The trauma seems here clearly responsible for the process which was of long standing, and yet in the absence of fissuring to loosen the fragments there had been no attempt at exfoliation of the necrotic bone. It is also notable that nine or ten months had elapsed after the injury before the ear trouble began.

An interesting but incompletely reported case which lacks any traumatic or other etiological factor is that of Christenneck (Arch. fur Ohrenh. XVIII, 293). A man of 54 years in Schwartze's clinic had fever, vomiting and dizziness, about August first, with otorrhoea only after twelve weeks, with lessened pain, the ear region having been exquisitely tender from the first. Facial palsy occurred one week later. In the middle of December the otorrhoea was profuse and fetid, with excessive granulations, but the mastoid was free of tenderness. Improvement was marked for two weeks, and on January 7th the carious cochlea was extruded with immediate gain and ultimate complete recovery with no palsy and some claims of hearing. This is reported as primary labyrinthine necrosis occurring within five months; but even considering the mere cochleal sequestrum removed one must suspect that some antecedent factors are unreported, so greatly does it conflict with almost all reported cases.

Alt sums up in Blau's Encyclopedia of Otology: "The necrosis affects most frequently the inner structure of the cochlea with involvement of the whole or a major part of the first turn. There is a special disposition to the affection in the first decade of life. The duration of the causative otorrhoea is from many months to twenty years. As symptoms of labyrinth-necrosis or exfoliation we may consider severe, long-standing pain in ear and head robbing the patient of sleep for weeks or months, profuse malodorous otorrhoea, polypoid growths quickly recurring after removal. Facial palsy (in 80 %), deafness and frequent but by no means constant vertigo. disturbance of equilibrium, vomiting and subjective noises. * * Death occurs in some 19% from meningitis."

In the causation of labyrinthine necrosis constitutional disease must be expected to count; and tuberculosis, syphilis and diabetes have been considered as factors. One of Gruber's cases was clearly tubercular, and most of us have seen the uncovering of the promontory and beginning of its necrosis in subjects of tuberculosis. Yet it is notable that no case of exfoliation of the labyrinth before death has been reported in tubercular adults. Syphilis is a still less proven influence; but diabetes demands careful consideration, since most authorities cite it as a cause of destructive ostitis of the mastoid. Yet it is curious to note how little clinical basis exists for such a view, and how rarely caries of the temporal bone has been found in autopsies of diabetics—only once, for instance, in fifty-five cases reported by Frerichs. Reports of diabetic mastoid disease are on record by Koerner, Raymend, Kuhn, and others; but few except Buck have seen more than a single case, and the primary central caries of the mastoid which has been set forth as distinctive has been rarely exemplified. In the case which I have reported there has been occasional glycoseria but in no other re-

spect can it be set down as diabetic. The healing was prompt after the removal of the sequestrum and the flesh previously lost was immediately regained. We have all seen inflammation of the mastoid in diabetics but few cases have gone on to caries, and these more probably from the intercurrent tuberculosis of which so many diabetics die.

The surgical questions of fracture of the petrous portion of the temporal bone might be discussed at length, as has been done by Barnick, Politzer and others; but it suffices here to recall the frequent occurrence of fissuring of the pyramid which has been undisclosed by serious symptoms unless intercurrent inflection has taken place. Most of the proven cases have died shortly and given some foundation for a claim that such injuries are hardly compatible with recovery; but there have been enough instances like the Collins case in the same issue of the Am. J. Med. Sc. as Shapleigh's case above cited, in which through surgical intervention, has proved the fracture and forestalled serious complications even when the dura has been ruptured and the brain substance extruded. A case well illustrating some of the matters under consideration is reported by J. Cheston Morris (Trans. College of Physicians, Philadelphia, IV, 219, 1876,) and the specimen is No. 18,489 in the Mütter Museum. A boy of sixteen has his skull crushed between his overturned cart and the pavement, was unconscious a few minutes, with free hemorrhage from his left ear, which began to suppurate on the third day. There was fracture with great mobility along the coronal suture and extensive exfoliation later took place—one fragment being three inches long. He recovered, but later in life became epileptic and finally insane, dying thirty-six years after the injury. The skull shows partial healing of the huge coronal gap with adherent dura and subdural cysts. There is a partly healed but gaping

fissure of the upper back wall of the left external auditory meatus and the ossicles with part of the drumhead are present. A healed fissure crosses transversely through the petrous pyramid anterior to the vertical semicircular canal and the carotid canal is narrowed by firm fibrous tissue. The huge left sigmoid sulcus and jugular fossa seem as little related to the injury as is the paramastoid process which is present on the right side. Such fissures are usually transverse to the petrous pyramid when the blow has been at the vertex or occiput, longitudinal when on the temporal or parietal region. The resulting lesions of the important adjacent structures have been most varied; and deafness, facial palsy, or great vertigo have been inexplicably absent in not a few instances. Healed fissures have been found after months or years without even deafness to point to such a lesion of the region, and while these have generally involved the internal auditory canal as a line of least resistance, the destruction of function has often been consecutive rather than direct, as in Kundrat's case of ossification of the labyrinth. Point was made in the case which I report that deafness was not immediately noted; but this loses force in the absence of such a note during the months of suppuration antedating the mastoid operations. That a grippal attack was the immediate cause of the outspoken trouble does not militate against the justice of ascribing to traumatism the predisposing influence by fissuring the temporal bone so as to give extension of the infection and to facilitate the loosening of the whole sequestrum. Frequently in the cases where death has followed these fractures at the base, there has been absence of serious symptoms until tonsilitis or other intercurrent inflammation has furnished an immediate exciting cause; and on the other hand there are few cases where the whole labyrinth of an individual in middle life has been extruded as the result of an ear suppuration,

uncomplicated by tuberculosis on the one hand or injury on the other.

DISCUSSION.

Dr. Tansley: I am pleased to hear this paper because I think you will all agree with me that it fills out a very great need. Away back in '76 I had a case which I reported in the New York Medical Record, the case being a boy of ten years of age. That is the only case I have ever had. The whole of the petrous bone in that case was involved and removed, and up to two years ago, when I last heard from the case, the patient was enjoying good health. I am rather surprised to hear of the large number of adult cases because it has never been my pleasure to meet one. They have always been in children.

Dr. Richey: I have seen and reported two cases of this kind.

Dr. Jack: I have here a specimen which is even more perfect than Dr. Randall's. The semicircular canals and the cochlea are as perfect as in a fresh specimen. It was easily removed and left, of course, a deep hole. There was permanent paralysis and total loss of hearing. It occurred ten years ago, and five years after the operation the patient was well and strong. The case was published in the Boston Medical and Surgical Journal with wood cut of the specimen.

Dr. Morse: I had a case this year, not with exfoliation of any portion of the petrous bone, but in which the point the doctor brings out about the fracture was of interest. The case was that of a man struck by a bar of iron on the side of the head. He was treated for the scalp wound and came into the infirmary some weeks later, when I operated and found a large portion of the parietal bone fractured. I took out quite a large piece of bone and there was extensive clot and a good deal of depression of the bone. After remov-

AUTHOR.	PUBLICATIONS.	SEX AND AGE.	DURATION AND CAUSE.	SEQUESTRUM.	RESULTS.
Crampton.	Wilde, Textbook, p. 358.	Young lady.		Whole cochlea.	Hemiplegia cured, facial palsy.
Schotti.	Gaz. Lomb.: Schmidt Jrb. CII, 134.	Man, 45.	6 years after head injury.	L. labyrinthe and petrous tip.	Trifacial and facial palsy.
Treltsch.	Virchow's Arch. XVII, 39.	Man, 37.	7 years.	Entire labyrinth demarc.	Autopsy, slight facial palsy.
Hinton.	Tr. Path. Soc. London, XV, 207.	Man, 55.	Many years.	Cochlea, caries both pyramids.	
Toynbee.	Arch. f. Ohrenh. I, 112.	Man, 40–50.	20 years.	R. cochlea.	Fleeting trifacial & facial paralysis
Agnew.	Am. M. Times, VI, 183; M. Record I, 338.	Man, 38.	32 years.	Whole labyrinth.	Facial palsy, meningitis: death.
Toynbee.	Arch. f. Ohrenh, I, 112.	Man, 34.	34 years.	L. most of labyrinth.	No palsy: death.
Toynbee.	Arch. f. Ohrenh. I, 112.	Man, 25.	Pain 10 years, discharges.	R. most of labyrinth.	Facial palsy: brain abscess, death
Gruber.	Alg. Wein. M. Zeitg. IX, 41.	Man, 42.	10 years, phthisis.	Whole labyrinth loose.	Facial palsy 5 wks. before death.
Richey.	Chicago M. J. & Exam. No. 36, '78.	Man, 40.	30 years after fall.	L. most of cochlea.	No palsy: recovery.
Schwartze.	Arch. f. Ohrenh. IX, 238.	Man, 38.	1 year.	L. most of cochlea.	No palsy: total deafness.
Schwartze.	Arch. f. Ohrenh. IX, 238.	Woman, 26.	1½ years.	L. cochlea.	No palsy: some hearing.
Lucae.	Arch. f. Ohrenh. X, 236.	Man, 30.	9 years, artillery fire.	R. cochlea, upper two-thirds.	Deaf.
Blake.	Trans. Am. Otol. Soc. 417, '80.	Man, 70.		Part of cochlea and semic c.	Facial palsy: improved.
Christenneck.	Arch. f. Ohrenh. XVIII, 293.	Man, 54.	5 months.	Cochlea.	Facial palsy: recovered.
Moos.	Arch. of Otology XII, 132.	Man, 20.	14 years, scarlatina.	Semicircular canal.	No palsy: recovered.
Bezold.	Arch. of Otology, XVI, 297.	Man, 28.	From youth.	Part of labyrinth.	Facial palsy: cured.
Bezold.	Arch. of Otology, XVI, 297.	Man, 41.	15 years.	Cochlea.	Facial palsy: cured.
Bezold.	Arch. of Otology, XVI, 297.	Man, 48.	41 years, kick on head.	Cochlea.	Recovered: Perman't facial palsy
Bezold.	Arch. of Otology. XVI, 297.	Woman, 39.	31 years, scarlet fever.	Most of pyramid.	No palsy: cholesteatoma.
Jacoby.	Arch. f. Ohrenh. XXI, 54	Man, 50.	8 months, tuberculosis.	Most of petrous loose.	Post-mortem finding.
Jacobson.	Arch. f. Ohrenh. XXI, 304.	Woman, 29.	29 years.	Whole labyrinth destroyed.	Pyemia: death, post-mortem find.
Hartmann.	Arch. of Otology, XVI. 252.	Man, 22.	2 years.	Cochlea, upper two-thirds.	Facial palsy: recovered.
Gruber.	Monats. f. Ohrenh. No. 8, '85.	Man, 39.	Since.	L. whole cochlea.	Facial palsy: improved.
Bezold.	Arch. of Otology, XXVII, 158.	Man, 62.	2 months.	L. Vestibula fragments.	Facial palsy: death.
Bezold.	Arch. of Otology, XXVII, 158.	Man, 53.	4 years,	L. Cochlea first turn.	Facial palsy: recovered.
Bezold.	Arch. of Otology, XXVII, 158.	Man, 30.	1 year: before at 6.	L. Cochlea first turn.	Facial palsy: recovered.
Bezold.	Arch. of Otology, XXVII, 158.	Man, 41.	31 years.	L. most of cochlea.	Facial palsy: cured.
Bezold.	Arch. of Otology, XXVII, 158.	Man, 21.	14 years, scarlatina.	L. Cochlea.	No palsy: death from meningitis
Kretschmann.	Arch. of Ohrenh., XXIII, 217.	Man, 48.	Many months.	Cochlea.	Deaf from first week.
Kretschmann.	Arch. f. Ohrenh., XXIII, 217.	Man, 26.	20 years.	R. cochlea.	Fleeting facial palsy: recovered.
Lannois.	Rev. Mens. de Laryng. July, '94.	Man, 26.	20 years, measles.	Whole cochlea.	No palsy.
Lannois.	Rev. Mens. de Laryng. July, '94.	Man, 68.	4½ months.	L. first turn of cochlea.	No palsy.
Connal.	Glasgow Med. J. XLIV, 161.	Man, 29.	25 years.	Cochlea.	No palsy.
Erskine.	Brit. Med. Jr. 477, '88.	Woman, 24.	4 years.	Whole labyrinth.	Facial palsy.
White.	Lancet, Dec. 17, '98.	Woman, 28.	From childhood.	Modiolus.	Perfect recovery.
Thies.	Arch. f. Ohrenh. XXX, 185.	Man, 26.	24 years, measles.	R. cochlea.	Facial palsy: cured.
Thies.	Arch. f. Ohrenh. XXX, 185.	Man, 56.	7 weeks.	R. part of cochlea.	Facial palsy: persists.
Max.	Wiener. Med. Woch '91.	Man, 23.	16 years, small pox.	Both cochlea.	Meningitis: death.
Lake.	Jour. Laryng. Rhin. & Ot. XVII, 115.	Man, 54.	50 years.	Whole labyrinth.	Hearing improved.
Haug.	Arch. f. Ohrenh. XLVII.	Woman.	Long standing.	Whole cochlea.	No palsy: cured.

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ing what seemed to be all the bone that would have to be taken out, I pressed upon the portion still remaining and found that the whole petrous bone tilted. The fracture had evidently extended a long distance forward.

This case was an adult, and he afterwards had convulsions and paralysis of the arm of the other side. He finally recovered and left the hospital a month after the operation with the wound healed and no dizziness, no symptoms whatever referable to the head, except total deafness. He was rather stupid, but I think that condition antedated the accident.

Dr. Sheppard: Dr. Buck speaks considerably of fracture of the temporal bone with no sequestrum following. He believes that it is impossible to have an injury to the head with rupture of the tympanic membrane, or canal wall, without there having been fracture of the temporal bone. He doesn't think these soft parts can be ruptured without the bone having been fractured. If that is true, we must all see a good many cases of fracture of the temporal bone, and many of them recover perfectly. I would like the doctor to give us his idea about that class of cases.

Dr. Randall: I have seen a number of cases, of course, of rupture of the drumhead from head-injury, ordinarily with fracture of the wall of the canal. A young lady, the daughter of a physician, has been under my care this past year with bilateral deafness ascribed to a fall from a bicycle, with bleeding from the left ear. The linear scar of the drum head and the fissure of the adjacent canal wall were defined, the deafness seemed obstructive only, and she notably improved under catheter treatment; but there is some impairment of the bone-conduction on the left. I think there are many cases where we have fracture of the walls of the canal, and there has been in many of these cases minute examination, even microscropic study upon the decalcified bone which has

proved no communication between the fissure of the external canal and that in the petrous portion of the bone, and we can have rupture of the deep bony parts, as well as of the soft parts, without having more than a spring of the squamous bone not surpassing its elastic possibilities and giving rise to no fissure of its bony structure. There are certainly many cases that would bear this out. The case I cite of Morris is more or less unknown, while there are cases recorded by Politzer and others where the same point is brought out, where there is fracture of the pyramid without fracture of the squama of the temporal bone. I hope you have been frankly outspoken with regard to this case, for, if I am wrong in my view of it, I wish to know it. It interested me greatly, and the frequent relation of trauma was a surprise to me, as it was to other men who were called as experts in the case.

WHAT MEANS, OTHER THAN OPERATIVE, HAVE WE FOR PREVENTING AND COMBATING INFLAMMATION OF THE MASTOID CELLS?

By Samuel Theobald, M. D., *Baltimore, Md.*

In attempting to answer the question, What means, other than operative, have we for preventing and combating inflammation of the mastoid cells? I shall have nothing to say regarding the application of cold to the mastoid process or concerning the local abstraction of blood, first, because I have had little experience with the former procedure—never having been greatly inclined to it—and, with the lapse of time, find myself less and less disposed to resort to the latter, and, next, because almost every otologist is familiar with these measurers and doubtless has a definite opinion of his own as to their value. What I shall speak of mainly is the employment of constitutional remedies for the purposes indicated, since in this direction I have had considerable experience, and, furthermore, it is a matter, it seems to me, to which otologists may, with profit, devote more consideration than they commonly do.

Twenty years ago I wrote a paper, which was published in the Medical News, upon "The use of constitutional remedies in the treatment of ear diseases."* In this paper I contended that in the treatment of aural affections too great reliance was placed upon local remedies and too little thought given to internal medication. In support of this view I pointed out how little was said upon the subject of constitutional remedies in the text-books of that day upon ear diseases, and cited, especially, the description

*The Medical News, Feb. 4 and 18, 1882.

of the treatment of inflammation of the mastoid cells given by the various authors quoted.

In the interval which has elapsed since then if any change of moment in this regard has taken place it certainly has escaped my observation, and, if I am not greatly mistaken, whatever warrant there was for the criticisms in the paper referred to exists as well at the present day. To any one inclined to call in question the correctness of this opinion I would suggest a perusal of what is said upon the treatment of mastoiditis interna in the text-books of Politzer, Buck, Bacon, Dench, Hovell, Bishop, McBride, and Gradle, and by the several authors who treat of this subject in the American text-book of Diseases of the Eye, Ear, Nose and Throat.

Indeed, I think, one may go farther and say that the otologist of today—and the observation applies with even greater force to the general practitioner—has less knowledge of the value of constitutional remedies and is less familiar with their proper administration than was his predecessor of the generation that has passed, or is passing, away. As a therapeutist, I venture to assert, the physician of today is not the equal of the practitioner of a quarter of a century ago; and, because he does not know when and how to administer drugs, he is becoming increasingly sceptical as to their value.

If there is one branch of medicine in which, more than any other, the efficaciousness of constitutional treatment is made manifest it is ophthalmology. The ophthalmic practitioner who is sceptical upon this point must, indeed, be a poor observer. And herein, I would suggest, lies the one advantage which the otologist who is also an ophthalmologist has over his purely otological brother—he is more familiar with and more ready to employ constitutional remedies; he has seen what mercury, the iodides, the salicylates, what quinine, iron and strychnine are capable

of accomplishing in inflammations of the eye, and he is, therefore, more inclined to turn to them when he encounters like conditions affecting the auditory apparatus.

What I have to say regarding non-operative measures for the *prevention* of inflammation of the mastoid cells it will be convenient to divide into what pertains to mastoiditis occurring as a consequence of chronic inflammatory processes of the ear and to that occurring as a complication of otitis media acuta.

In regard to the first mentioned class of cases, the indication, of course, is to control the inflammation in the tympanum and so do away with the risk of its extension to the antrum and mastoid cells; and my experience is that, usually, this is not difficult of accomplishment.

The chief suggestion I have to offer here is that, in addition to building up the system by suitable tonics and eliminating habitual constipation, if it be present, we should find by trial the antiseptic solution which exerts the most effective control over the suppuration, and that having found this, instead of compelling the patient to depend upon the surgeon for its application—of which, sooner or later, he is sure to tire—we should teach him to use it himself—to syringe or douche the ear as often, or as seldom, as may be required to keep it clean and dry. And here I may state, in parenthesis, that the view I remember to have heard expressed at a recent meeting of this society, that this plan of treatment is impracticable and inefficacious, I know from abundant experience to be without justification.

The antiseptic agent which I have found most generally useful for this purpose is the bichloride of mercury, the next most useful, boracic acid. The former I have employed in solutions of from 1 to 8000 to 1 to 4000, the latter in saturated solution. Except when the discharge is very profuse a daily syringing suffices, and after a short period of treatment it is usually possible to increase grad-

ually the interval to a week or more. After these longer intervals an occasional inspection of the ear by the aurist is desirable, as it enables him to decide whether the effect is all that is expected, whether the suppurative process is being kept completely under control. The small tablets of bichloride of mercury furnished by Park, Davis & Co. and by other manufacturing druggists—one tablet in a pint of water giving a strength of 1 to 4000—afford a convenient means of making the requisite solution, and for domestic use the rubber-bulb syringe has been found most satisfactory. A combination of the phosphates of iron, quinine and strychnine* is the tonic which I have learned to place the greatest confidence in, and for habitual constipation aloin, in doses of a tenth to a fifth of a grain, given every night for as long a time as may be required, has proved very efficacious.

A weekly or fortnightly syringing of the ear by the patient is no great hardship, and if it were necessary to continue it indefinitely would be but a small price to pay for the comfort and safety which it ensures; but, as a matter of fact, the cases in which this is required are the exception, and the rule is that after the suppuration has been checked for a few weeks the ear remains for weeks or even months without requiring further attention.

To avoid implication of the mastoid cells in *acute* inflammation of the middle ear energetic measures should be employed to control the otitis and, if possible, to abort it in its incipience; and here again constitutional as well as local treatment is called for. How far we are likely to be successful in accomplishing this will depend largely upon the cause of the attack—the nature of the infection—and the stage which the otitis has reached at the time the case

*The elixir of the phosphates of iron, quinine and strychnine made by Wyeth & Brother is especially to be commended, as it contains two grains of iron and one grain of quinine to the drachm, more than four times as much as do some preparations called by the same name.

comes under observation. When we have to deal with a streptococcus or a pneumococcus infection, our efforts are less likely, of course, to prove successful; but, if we see the case in its incipience, I believe I am not too optimistic in saying that, as a rule, we should be able to cut short the attack and prevent its reaching the stage when a spontaneous perforation may be expected or an incision of the tympanic membrane be required.

Some excellent otological authorities hold that in otitis media no good is accomplished by the application of anodyne solutions to the ear. Upon what grounds they base this opinion I do not know; but, at all events, my experience leads me to hold a distinctly different view. In my own mind there exists no doubt whatever that the solution of cocaine and atropine which I have commended upon several occasions not only alleviates or relieves the the pain of middle-ear inflammation, but that it exerts a definitely favorable influence upon the inflammatory process. The prescribing of this solution is, therefore, a matter of routine with me in every case of otitis media which I encounter.*

I have also an abiding faith in the antiphlogistic value of energetic purgation, especially when calomel, in liberal proportion, forms an ingredient of the purgative employed. Unless, therefore, there is some distinct contra-indication, the local treatment is usually supplemented by one or two doses of calomel, scammony and rhubarb†, a combination for which I have inherited a predelection from my grandfather, the late Prof. Nathan R. Smith.

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*The formula is: Atropine (alk.) gr. ij, cocaine (alk.) gr. iv, ol. amyg. dulc. ℥ss. Six to ten drops, warmed, to be poured into the ear three or four times in twenty-four hours.

†Two grains each of calomel and powdered scammony and six grains of powdered rhubarb is a suitable dose for a child from five to fifteen years of age, and for an adult the calomel may be doubled in amount and the rhubarb increased by three or four grains.

Another remedy as to the value of which in otitis media I have no misgivings is the pyrophosphate of soda. Like many other useful drugs—the salicylate of soda, for example—if given in small doses it is entirely inefficient, but when administered in liberal doses—20 grains every two hours for an adult, or 10 to 15 grains as often for a child—it unquestionably exerts a controlling influence upon suppurative processes, whether they are located in the the ear or in some other part of the body. When, therefore, the otitis does not yield as promptly as anticipated to the purgative and the atropine and cocaine drops, the pyrophospate of soda, in the doses indicated, is prescribed.* Usually no noteworthy effect follows its administration other than its beneficial influence upon the inflammation, but occasionally some loosening of the bowels or, perhaps, a little nausea is observed.

If an otorrhoea exists or becomes established through Nature's efforts or through surgical intervention, the ear is syringed, not usually more than two or three times a day, with a saturated solution of boracic acid, which, after three or four days, is put aside for a 1 to 8000 solution of bichloride of mercury, if the improvement expected—a diminution in the amount and a change for the better in the character of the discharge—is not observed.

Since the purpose of this paper, as indicated in the title, is to deal with non-operative means for the prevention and cure of inflammation of the mastoid cells, I have said nothing of the indications for incising the drumhead. It is, of course, a measure of the utmost value, but it is one, I believe, which is often resorted to unnecessarily. To neglect to perform this simple operation when it is clearly called for—when the pent-up products of inflammation are demanding evacuation—is doubtless more reprehensible

* It should be prescribed in solution and, as it is not very soluble, one should not order more than twenty grains to the half ounce of water.

than to perform it unnecessarily; but, while this is true, it is also true that there is a stage—at the outset of even well marked cases of otitis media—in which it is not good surgery to resort to it, in which there is little or no accumulation of fluid in the tympanic cavity, and, therefore, nothing to be gained by piercing the membrane; and it is in this stage that the local and constitutional remedies I have described should be employed. Although, in itself, a trivial procedure, the making of an opening in the drum-membrane unquestionably affords, notwithstanding every possible antiseptic precaution, a fresh avenue for bacterial invasion, and every aurist knows how quickly, as a rule, the serous discharge which usually escapes when the membrane is incised assumes a distinctly purulent character. Having in mind this aspect of the matter, it seems well worth while that remedial measures which, to say the least, very often render unnecessary the use of the knife, should not be neglected.

That the mastoid cells, or at all events the antrum, are much more frequently implicated in otitis media than was formerly believed to be the case is now very generally conceded; so that when we suppose we are treating an inflammation of the tympanum only it often happens that we are, in reality, dealing with a mastoiditis interna as well. Whether other definite signs of mastoid implication, apart from the profuseness of the otorrhoea, supposing a discharge from the ear to have become established, shall manifest themselves or not depends largely, first, upon the sufficiency of the drainage from the antrum and other involved cells and, second, upon the intensity of the inflammation in these cells—whether this has assumed the character of a periostitis or whether it is only a catarrhal process of their lining mucous membrane; for it is to be borne in mind that the membrane which lines the cells of the mastoid process is, at once, a mucous and a periosteal membrane,

and may, therefore, be the seat of inflammation differing very materially in type and in intensity.

With retention of inflammatory products in the cells, pain in the mastoid region, and probably over the side of the head, is almost sure to manifest itself, and with the development of internal periostitis, not only pain but tenderness of the mastoid process to pressure, followed sooner or later by redness and oedema, are to be expected. Another sign of mastoid involvement, to my mind almost as characteristic as the copiousness of the discharge and the bulging of the superior and posterior wall of the auditory canal, which becomes evident later, is the sodden and altered appearance of the tympanic membrane—that condition of the membrane which prevents even the expert from distinguishing any of its features, which, indeed, makes it almost or quite impossible for him to tell what is and what is not membrane. If an approximation to this condition occurs in inflammation limited to the tympanum it is, at all events, evanescent.

When any of these definite indications that the mastoid cells are implicated in the inflammatory process manifest themselves in the course of an otitis media, what measures, other than operative, can we take to combat them? First let me qualify the statement "other than operative" by excepting incision of the drum-membrane, for, unquestionably, whenever mastoiditis exists this step is demanded, unless nature has already provided an opening large enough to afford efficient drainage.

In describing the treatment which has been found efficacious in controlling inflammation of the middle ear, all of the remedial measures which I would commend in the early stages of mastoiditis interna, except one, have been mentioned. If active purgation is indicated in the former condition it is more urgently demanded in the latter, and the same observation applies to the liberal administration of

the pyrophospate of soda. The same antiseptic solutions for cleansing the ear are called for in each condition, though in the latter, owing to the profuseness of the discharge, more frequent irrigation is required. The atropine and cocaine drops will also be found useful in alleviating the pain, though their action must be more carefully watched when a perforation of the drum-head exists, since they may find their way through the Eustachian tube into the throat and so impress the system.*

The one remedy which I have not mentioned is mercury —mercury given not as a cathartic, but given to produce its specific effect upon the system. Bearing in mind what has been said as to the peculiar characteristics of the membrane which lines the mastoid cells—that it is a periosteal as well as a mucous membrane—it should not be a matter of wonderment, it seems to me, that in inflammation involving the walls of these cells, especially in its early stages, before the actual formation of pus, mercury, of all remedies, should prove efficacious. That when given in proper doses and in suitable cases it *is* efficacious there can be no question whatever. That it is not indicated in mastoiditis occurring in cachetic individuals, in distinctly strumous subjects, goes without saying, but in fairly robust individuals, whether adults or children, and especially when the mastoiditis is dependent upon an acute middle-ear inflammation, it is a most valuable agent, and should be administered without hesitation if the remedies already described have proved ineffectual or, if the symptoms are urgent, without waiting to try other less potent drugs.

There are various ways, of course, in which the system may be brought under the influence of mercury ; but if, as is usually the case, prompt results are demanded, small

*One of the advantages of using an oily solution of these alkaloids is that this is less likely to happen than when a watery solution is employed.

doses of calomel frequently repeated, a quarter or a half of a grain every hour or every two hours, supplemented by inunctions of mercurial ointment, and, if necessary, guarded by opium in sufficient quantity to prevent purgation, afford the most convenient way of accomplishing the desired end. In adults, when urgency is not demanded, the biniodide of mercury, given in full doses, answers an excellent purpose.

In my paper upon the use of constitutional remedies in the treatment of ear diseases, to which reference has been made, I quoted from Dr. Buck's excellent treatise upon diseases of the ear a description of an interesting case of very severe acute, bilateral otitis media in a child six years of age, in which, with a pulse of 140 and a temperature of 105°, delirium was present. In spite of a free incision made in each tympanic membrane by Dr. Buck, the condition of the child continued to grow worse, and on the following day partial coma was present, the pulse and temperature showed no change for the better and there was no discharge from either ear. Drs. Markoe and James R. Wood were now called in consultation, and at their suggestion "mercury was administered: internally, in the form of calomel, in small doses; externally, in the form of inunctions of the oleate of mercury (10 per cent.), frequently repeated. Bromide of potassium was also given, in conjunction with the calomel." The next morning, Dr. Buck goes on to relate, the child was "very much better, an active discharge having established itself in both ears during the night;" and "from this time on," he tells us, "she made a rapid recovery, and regained her hearing almost perfectly."[1]

I allude to this case again not only because it affords such a striking example of what mercury, when properly administered, is capable of accomplishing even under most unpromising conditions, but because, in addition, it

illustrates so well the therapeutic methods of the medical men of that day, the men of a quarter of a century ago, who I have had the temerity to declare were better therapeutists than their successors of today.

The measure of success which is likely to attend our efforts to combat inflammation of the mastoid cells by the non-operative means which I have described, will, of course, depend largely upon the stage at which the treatment is begun. When their employment is too long delayed not much can be expected of them; but, in view of the frequency with which the mastoid process is opened without pus being found, we should be cautious, I would suggest, in concluding too hastily that the period is passed when a trial of these measures is justifiable. To attempt to lay down hard and fast rules bearing upon this point would be impracticable and, furthermore, would be, in effect, to open up the whole vexed question of the indications for operating upon the mastoid process, and this is not my present purpose.

DISCUSSION.

Dr. Tansley: I take, as many of you know, very ultra views upon this subject. I am in favor of operating early, and not waiting for medication. Naturally we all resort to the use of medicine to relieve the symptoms so far as we can, but no anodynes upon any consideration. I would like to mention two cases if you will permit me. Several years ago I was called by Dr. Oppenheimer of New York to see his father, who had an acute middle ear trouble, accompanied with considerable pain and tenderness of the mastoid. We applied leeches early in the afternoon, and, before we succeeded in stopping the bleeding, it was midnight, and the patient was almost exsanguinated, and I ascertained that he was a "bleeder." We

could not perforate the drum, open the mastoid, or adopt any other operative procedure. We had Dr. Knapp in consultation twice, and were at our wits' end. The symptoms were getting worse, the patient had a great deal of pain, and there were some cerebral symptoms. Finally, in our extremity, Dr. Oppenheimer said: "I am going to give that man quinine," and under that treatment the patient got well in four or five days, without an operation. The other case that I would mention was that of an elderly lady with an acute attack, who seemed to get a little better under treatment. I wanted to operate, but she objected, and I hesitated, as she seemed to be doing well under medication. The patient suddenly became comatose one night, and died before I could reach her bedside.

There is no doubt that many of these cases will recover, but, if you find streptococci in the discharges, do not wait for medication, for it can do no possible good. Now that we all operate antiseptically there is no contraindication to an operation, except for cosmetic reasons, and we are not justified in waiting for medication. I believe in regard to medicine that we should all of course try it, but we should not forget that operation is absolutely necessary in many cases, and that, while you may cure some of them, there are others that you cannot possibly benefit except by operation. For my part I would much prefer to operate and find that it was not necessary, than *not* to operate and find subsequently that it had been necessary. As to the use of mercury, I agree with the doctor that it is an excellent procedure, and it is my custom to use it almost invariably.

Dr. Richey: I have listened to this paper with a great deal of interest, and have been much impressed. I do not know whether it is because my experiences have been fortunate, or that I have seen a different class of cases, or what the cause, but my experience in the past

fifteen years has been very different from that of some of my colleagues, for I have not in that period been compelled to trephine once, though previously it had been a frequent occurrence. My cases have been numerous, and have recovered without operation. The method of treatment adopted *in the beginning* is important. The Politzer method of inflation, and the use of peroxide of hydrogen, I consider two measures used by the otologist of today as most inimical to life in these cases. In acute otitis media there is swelling of all the soft tissues, and this swelling occludes the *aditus ad antrum* to the passage of germs for a time, making interference possible. I *always* use the eustachian catheter in such cases, because it is *the* means of making the application directly to the bad ear, and not to the good one. The germs are not *forced* further back, but, by the injection of an antiseptic solution through the catheter, the secretions are diluted, and then by means of suction removed. I have withdrawn as much as a catheter one and one-half times full of secretion at a sitting. The solution is forced in gently at first, until, as far as possible, the germs are killed, and many cases due to grippe have recovered under this management in from two to nine days, some without perforation of the drum membrane. Even mastoid inflammation (acute) has been relieved permanently by me in this way, combined with the application of heat, and the exhibition of mercurials.

This may be exceptional, and luck, but, so long as my results are of such character, I cannot change my practice to that of some of my colleagues.

Dr. Johnson: We cannot know what form of inflammation we have to deal with in the incipient stage of these troubles. It is certain that there are forms of medication efficient in the early stages. One thing I would like to recommend is the use of adrenalin applied to the mouth of the Eustachian canal. I have seen some cases where this

application opened up the orifice and allowed the material from the middle ear to flow down into the nasal cavity, and I certainly think it is worth while to try this method of releasing fluid from the tympanic cavity before resorting to paracentesis of the drum membrane.

Dr. Woods: If I remember correctly, Dr. Bacon in his recent book speaks of the effect of mercury in the early stage of inflammation of the tympanum and mastoid. I think every man is guided by his own clinical experience, and it is not unusual for one to find a certain amount of mastoid tenderness which can be mistaken for a mastoiditis. These cases do undoubtedly get better under mercurials, rest in bed, diaphoresis, etc. I can testify to the beneficial effect of cocaine and atropia applications where there is a considerable amount of congestion of malleus, plexus and Schrapnell's membrane. These local applications undoubtedly afford relief, but, when it comes to relying upon any form of medication in the cases the doctor speaks of, where there is the soggy appearance of the drumhead, sagging of anterior canal wall, etc., I should consider such a course as fraught with considerable danger. I recall one case in which ten days were lost in this way, and when the patient finally came to operation the sinus was exposed to quite an extent. In another case that I saw this winter I operated, though there was not much pain or tenderness, only profuse otorrhoea, and there was a Bezold abscess under the tip. It is the uncertainty of these cases that would lead me to operate. I would like to ask Dr. Theobald if he has cases on record where after this appearance, profuse otorrhoea, soggy drumhead, etc., they have subsided under the constitutional treatment?

Dr. Randall: I account myself a very poor therapeutist, but have always tried to follow out very much the ideas Dr. Theobald has laid down, although in our

quiet city of Philadelphia I am regarded as rather bloodthirsty in the matter of operating.

I have long seen every year upwards of a hundred cases of inflammation of the mastoid which have yielded to such measures, although at the same time I have operated on from thirty to fifty cases of empyema and caries of the mastoid. This would seem to show that I am not very radically inclined. I believe there are one or two very elementary points which should be borne in mind in our discussion here if it is to be made otherwise than at cross purposes. There must be a distinction made between inflammation of the mastoid, or periostitis externa or interna, and an empyema and caries of the mastoid. There is no doubt that a great majority of the cases of inflammation of the mastoid structures recover perfectly under proper treatment without any operative interference; but where we have pus it is extremely doubtful if the empyema can be relieved without operative measures. There are many, however, who claim that it can, and they point to the similar conditions in the accessory sinuses of the nose, which are, however, more open. It is certainly possible that in the more difficult region of the ear the same thing may occur.

It has been my good fortune to bring through most of the cases of mastoid inflammation seen early without having to operate. In the last fifteen years in over fifteen hundred cases with well marked symptoms of mastoid inflammation I have had less than one per cent. that went on to operation. That would seem to bear out very well the experience of Drs. Theobald and Richey; but, on the other hand, in some five hundred operations which I have done I have found pus in every one, or carious bone, and certainly doubt if they could have been brought through without operation. There are some of us whose experience represents the extremes; with most of us it is more

varied. In our discussion there must be a certain amount of give and take and a discrimination in the terms we are using. We should not use a general term to cloak the whole subject.

Dr. Holt: I think we should all be very thankful to Dr. Theobald for his paper because it contains so many suggestions to assist us where patients do not want an operation. We are apt to leave therapeutics out of consideration as he says. I used to give cocaine and atropia, but for the last half dozen years I have found that a 25% solution of carbolic acid and glycerine relieves the pain and acts more like a leech than anything I have tried.

I remember one case where I had appointed the time for operation. The patient had extreme pain, with swelling of the mastoid and a continous discharge of creamy pus containing streptococci. I was taken sick, and the patient refused to allow any one else to operate. She was an invalid and had been using peroxide applied on a little cotton spun on the end of a tooth-pick and she continued to use that. When I got well some six weeks later she came back to me with a perfect mastoid, the membrane restored and hearing perfect. So extreme cases may get well with rest and the use of peroxide. I have gotten out of the way of syringing ears and teach my patients to use the cotton on the end of a tooth-pick as an applicator.

Dr. Bacon: Dr. Theobald did not mention in regard to the use of calomel whether he found it more efficacious in the early or late treatment. I have recommended its use in small doses in the early stage and it seems to me that at that time we get the best effect. I must differ with him in regard to the treatment of these cases and am sorry that he has not offered any statistics in regard to cases that have recovered without operation.

In a paper read before the Academy of Medicine some two years ago I gave statistics of forty cases of mastoid

disease and thirty, or 75% recovered without operation. They were taken in regular order and it seemed to me that was about the proportion I had of cases that did not go to operation. The treatment was entirely different though, consisting in a free incision of the membrane and the application of the artificial leech and Leiter coil. The patients were also put to bed and small doses of calomel administered until the laxative effect had been produced. I would like to ask Dr. Theobald for any statistics he may have.

Dr. McKernon: I think absolute rest in bed in the early stage of mastoiditis is one of the most important means of treatment that I know of. Apropos of Dr. Theobald's suggestion of the use of the sodium salt, I saw two cases last year, both in the aged, where on account of the debilitated condition of the patients operation could not be resorted to, although there was every evidence of pus involvement of the mastoid. One case was that of a woman seventy-four years of age suffering from Bright's disease and operation was absolutely refused. The infection was a mixed one and the case was treated by the administration of a sodium salt with the addition of colchicum, 15 grs. of the sodium salt (sodium salicylate) every three hours and 6 minims of wine of colchicum every three hours. There was swelling over the mastoid and bulging of the posterior superior wall of the canal. To my surprise I was informed two weeks afterwards that the case had entirely cleared up. About three months later I tested the patient's hearing and found it just as good on that side as on the other.

The other case was that of a man eighty-four years of age, suffering also with Bright's disease and operation was refused. This case was seen some five months later and I suggested the use of the sodium salt and here also resolution took place and some months afterward I found

the hearing practically normal. So some of these cases certainly do clear up in this way. I believe there was pus in the mastoid in both these cases. In regard to the streptococcic infection several years ago I suggested the advisability of always examining the discharge from the canal and where streptococci were found in abundance a guarded prognosis as to resolution should always be given and I am glad to see that the members are taking that view of it.

DR. JACK: There is one point in diagnosis in cases of mastoid inflammation that has not been mentioned, a symptom which, in my experience, has proven almost without exception invaluable. I refer to tenderness over the posterior part of the mastoid deep under, upon pressing forward and outward. Whenever I have this symptom I usually operate.

We have all been surprised on opening mastoids that have shown very little evidence of disease, to find extensive trouble within the bone; pus lying along the soft wall of the lateral sinus or extensive carious process in the bone. I have always looked upon patients with this tenderness I speak of as likely to develop chill and temperature at any moment. It is better to err on the operative side. I have not relied upon drugs very much and feel a great deal safer after my case has been operated upon.

DR. GRUENING: As to Dr. Jack's remarks I would say a few words. Ten years ago I read a paper before this society on empyema and caries of the mastoid process, not on mastoiditis, or inflammation of the mastoid, but on empyema and caries of the mastoid, and, I said that in these cases there may be present all the symptoms as the text books give them, or none of the symptoms as laid down. That there may be no bulging, no pain, no fever, etc., that these may be present or may be absent, but one symptom is always present and that is persistent tenderness, and I was willing then to operate when this persis-

tent tenderness was present, but to know that it was necessary to have the patient under observation for some time. When I find persistent post-mastoid tenderness I know that the sinus is involved and it is generally a grave case. I agree with Dr. Jack in saying that whether temperature is high or low is immaterial, or whether these other symptoms are present or not, if the tenderness is persistent I operate.

Dr. Theobald: In regard to Dr. Richey's exceptional experience in not having to operate upon the mastoid at all for a number of years, I would remark he must have had an unusually lucky run of cases. I have not had such an exemption as he speaks of and think he is to be congratulated.

As to Dr. Johnson's suggestion about adrenalin, I can imagine it might do good in the way he suggests, by lessening congestion at the mouth of the Eustachian tube and thus promoting drainage.

Dr. Woods says Dr. Bacon mentions the use of mercury in the early stage of mastoiditis; that is true. He says that small doses of calomel ($\frac{1}{10}$ grain) should be given every hour until six doses have been administered or a laxative effect has been produced; but that is all he says about it and from my point of view the administration of six-tenths of a grain of calomel does not amount to much. As for laying down any exact rule as to how long one is justified in delaying operative procedures, I did not attempt to say where the line should be drawn.

Dr. Randall practically expresses my ideas, and I think they were brought out in any paper, that we may expect benefit from these measures especially when resorted to before pus has collected in the cells. That practically answers Dr. Bacon's question also as to whether I found them useful chiefly in the early stages of the trouble.

Dr. Jack's remarks remind me to say that I hope I have

not given the impression that I do not believe in the value of mastoid operations. Although I am sure I have not operated in the same percentage of cases as most of our members, because I have been able so often to control the inflammation by the measures described, I recognize that the opening the mastoid process is, under certain conditions, a procedure of the greatest value, which, of course, no one would attempt to deny. I have not gone over my cases to put them in tabular form, and cannot say how many have been controlled by non-operative measures and how many have gone to operation, but I can recall many cases in which most otologists would have considered it incumbent upon them to operate, that I have controlled without resort to operation. In some of these redness and oedema as well as tenderness of the mastoid were present, with profuse discharge from the ear and pain over the side of the head. However, as I have already said I do not wish to be understood for a moment as decrying the operation of opening the mastoid when it is clearly indicated.

A CASE OF SARCOMA OF THE TEMPORAL BONE.

(With Illustration.)

By Charles J. Kipp, M. D., *Newark, N. J.*

C. H., five years of age, was brought to the Newark Eye and Ear Infirmary on account of pain in and a swelling back of his ears, on March 16, 1900. According to the father's statements, the boy had had at no time, before the present attack, pain in or a discharge from his ears. He had measles some time ago, but no ear symptoms were noticed at the time. About a month before he came to the Infirmary he began to complain of pain in his ear. His mother syringed the ear, but did not consult a physician about it. About a week ago a fleshy mass was first seen in the external meatus, and this has steadily increased in size since then. He has had great pain in his ear for several weeks. I found the external meatus completely filled by a fleshy mass, in appearance like an ordinary polypus. Pressure on the ear caused offensive purulent fluid to come out of the meatus. As I was about to leave the hospital when the boy was brought in, and the boy was in great pain, I concluded to remove the polypus at once, as I thought that it caused retention of pus in the ear, and to postpone further procedure till next day. I had no difficulty in removing with a snare the growth, which seemed to spring from the lower wall, close to the membrana tympani. The removal of the growth was followed by considerable bleeding, which stopped, however, on plugging the external canal. The operation was not fol-

lowed by relief of the pain in the ear. This ear was apparently totally deaf. Tuning forks placed on median line were heard best in the deaf ear. On the following day, while he was under the influence of ether, I made a careful exploration and found a large hole in the lower wall of the osseous canal, close to the tympanic membrane; from this hole a probe could be passed downward and inward, and on withdrawing the probe much purulent fluid escaped from the hole. The region of the mastoid was swollen but not red, and for some distance below the auricle the soft part felt boggy. No distinct fluctuation could be detected. No enlarged lymphatic glands could be felt anywhere about the auricle. The drum membrane was of a deep red color and swollen, and a small perforation was found in the posterior half. There was nothing in the appearance of the ear or the surrounding parts which aroused a suspicion that the case was anything other than an ordinary otitis media purulenta with extension of the disease to the mastoid, and I therefore proceeded in the usual way to open the antrum. On making the incision from below upward through the soft part, the knife at once opened a large cavity below and in front of the apex of the mastoid. This cavity was full of granulation of large size, some of them as large as a small pea, and of a greenish color. I removed a considerable quantity of the same with a spoon and put them aside for microscopical examination, but they were unfortunately thrown away by one of the nurses before the operation was finished. This cavity extended far in towards the pharynx. The cortex of the mastoid was quite soft and so was the posterior upper and lower wall of the external canal. I was able to remove all of the softened bone with a sharp spoon and by the time I had got through curetting but little of the posterior upper and lower walls of the external canal remained, the antrum and the tympanic cavity

were one cavity: the hammer and incus were removed with forceps, and the tympanic cavity cleaned of granulation. I do not remember ever to have had another case in which the bone was so soft and could be scraped away with so little force. The cavity was packed in the usual way and the boy put to bed. Temperature was 102 before the operation, but fell to about 100 after the operation, and remained at this point during the following two weeks. Nothing noteworthy occurred during the first month after the operation, except an unusually rapid and very profuse growth of granulation from every part of the wound. We tried firm packing, cauterization with nitrate of silver and the galvanic cautery, but with little effect. In the beginning of May the whole cavity was filled with a fleshy mass and by the fifteenth of this month this mass had grown at least half an inch above the level of the outer plate of the bone. On the 16th of May I put the boy once more under the influence of ether, and removed all of the mass and also all softened bone with sharp spoons and gouges. The operation was not followed by unpleasant reaction but the fleshy masses soon sprouted again from all parts of the cavity and grew so luxuriantly that they protruded again above the level of the bone in about two weeks. The boy's temperature was never over 101 during this time, and most of the time it was about normal. About the first of June he began to complain of headache and pain in his ear, and nothing but the free use of morphine allayed the pain. Paralysis of the facial nerve followed a few days later, and the ophthalmoscope, which had been frequently used for the examination of the eyes since he first came under observation, now showed a beginning optic neuritis in both eyes. He lost flesh quite rapidly, while the tumor steadily increased in size. I did not attempt to remove again the growth, but sent the boy home, where he died

about three months later. The tumor, removed after death, weighed six pounds, eight ounces, and measured twenty-five inches in circumference. No autopsy made. This photograph was taken in July, about two months before his death.

I have seen and operated on several other cases presenting about the same clinical features, but in all of them the disease, so far as I know, did not return in any one of them. The microscopical examination of the masses removed at the first operation was very unsatisfactory. I could not positively say that the bits of tissue examined were characteristic of a sarcoma, but consisted of small round cells, with but little intercellular tissue. The masses removed at the second operation left no doubt as to its sarcomatous character.

I was struck at the first operation with the peculiar greenish color and the large size of the granulation contained in the cavity in the soft parts beneath and in front of the mastoid. They were so entirely different in appearance from anything that I had previously seen in connection with mastoid disease that I called the attention of my assistants to them at the time. I regret exceedingly that they were lost. The very soft condition of the bone was another feature that attracted my attention at the time, but in all other respects the case was like most other cases of mastoid disease due to purulent middle ear inflammation, and suspicion of the malignant character of the disease was not aroused till the very rapid growth of the mass was noticed some weeks after the first operation.

I am indebted to Mr. W. A. Condict of Dover, N. J., who treated the boy after his discharge from the hospital, for the photograph and the history of the case subsequent to his discharge from the infirmary.

DISCUSSION.

DR. FRIDENBERG: I think these cases are not usually recognized until operation. In my case the discharge was scant and the mass itself seemed soft. I made a diagnosis of empyema which had broken through and when I cut down I found that it reached the bone and had eaten it away. The question of what we should do in cases of this kind if the diagnosis is made before operation is of importance. I should be inclined to operate and then use Poley's method of mixed toxines.

DR. RANDALL: The one case of the kind which I have seen, although I have met several very suspicious ones in which there was no recurrence, was in a woman of fifty where the tumor mass had a white cauliflower appearance and bled with a freedom that I have never seen from any other growth. There was much the same history, except a rapid breaking down and pus-formation with rupture of purulent material into the pharynx and the patient rapidly succumbed. Patients have been operated on with freedom from recurrence by Marmaduke Sheild and others.

DR. JOHNSON: It would seem as though operative procedure is necessary only to relieve the symptoms. As to the suggestion of the use of toxines, I do not think Dr. Poley considers that the injections would do any good in a case that originated in bone.

DR. ABBOTT: The x-ray is coming to the front rapidly and if I had a case of the kind I should use that before operating.

DR. JOHNSON: I do not think the x-ray would be of service in a sarcomatous case, though I have seen a case of epithelioma treated in that way where the improvement lasted five months.

Dr. Abbott: The most brilliant results of the x-ray have been reported on sarcoma in this region.

Dr. Kipp: We gave this patient injections of the serum every day but it did not do any good.

SOME OBSERVATIONS ON STACKE'S OPERATION.

By Thomas R. Pooley, M. D., *New York, N. Y.*

The operation of tympano-mastoid exenteration which is now generally known as Stacke's, or the radical operation, is an evisceration of the interior of the bone by making the mastoid, tympanum, epitympanum and meatus one large cavity with perfectly smooth healthy walls, by removing the external cortex of the mastoid, its entire cancellated structure, the posterior osseous meatus wall, the tympanic membrane, the malleus, incus and outer wall of the epitympanum.

It is not the intention of this paper to describe the technique of the operation by which this is accomplished, since this is, no doubt, familiar to you all. I will only say that there are two methods, one advocated by Schwartze, Zaufal and their followers. In the first, you open from behind forward and that of Stacke opens from in front backwards. The former, that is to say, the Schwartze, you extirpate the posterior, superior membranous linings of the osseous meatus. The latter saves them to make a flap for covering exposed bone. For this latter procedure there have been many methods suggested. It is not my purpose, however, to describe them, since all have but one end in view, viz., the covering of the bare bone and the causing of epidermization of the cavity which is left by the operation.

This operation has been performed not only in chronic otorrhoeas but also in the surgery of brain disease. In

my remarks, however, I will confine myself particularly to its use in the first named. In my judgment the application of this operative procedure to the cure of chronic otorrhoea is becoming too universal and indiscriminate. It is for the purpose, then, of sustaining this argument that this paper has been written.

I shall first point out what I consider the dangers of the operation and the objections to its performance except in carefully selected cases.

The dangers of the operation are by no means few and may be enumerated as follows:

1. The wounding of the facial nerve, dura, lateral sinus and the semi-circular canals.

2. The facial nerve may be wounded on account of its anomalous position, carelessness in chiseling too near the floor of the external canal, or the too tight packing of the wound. In using the middle ear curette it must not be forgotten that the tympanic walls are often very thin from necrosis and the internal carotid artery as well as internal jugular vein are imperfectly protected and liable to be penetrated.

In carrying the operative procedure upwards and backwards the semicircular canals must be avoided.

In contemplating this operation it must be taken into account that a radical cure is by no means always obtained by one operation. A second operation, or even a third or fourth may be necessary in order to obtain a complete cure of the otorrhoea.

The length of time required for the healing process may vary from three to six months. And lastly, the possibility of permanent impairment of hearing in patients who, before the operation, could hear fairly well.

If, then, we consider the dangers enumerated, the uncertainty of a radical cure after one operation, the long duration of the after-treatment, it seems to me that every

case af chronic otorrhoea should be most carefully studied before being subjected to such a severe operative procedure. And while I do not wish to detract from the merits of the operation in well selected cases, I do desire to express the view that all cases of chronic otorrhoea should not be indiscriminately so treated.

I know that the present trend of opinion is to discountenance altogether a proctracted attempt to cure otorrhoea by medication, removal of polypi and intra-tympanic curetting. Nevertheless I venture to say that all of these methods often meet with success, thus avoiding the more radical procedure.

Many cases of chronic suppuration of the middle ear can be healed by vigorous anti-septic treatment, by removing granulations, cholesteatoma in the cavity of the tympanum and the attic by partially removing the attic wall, and such I think, must have been the experience of all who have strenuously followed these methods; therefore, while I am an advocate of the radical operation in suitable cases, I agree with Politzer that it is not justifiable when performed for the mere purpose of arresting a discharge, at least, until every effort to stop it by other means had proved unavailable.

Those who are the strong partisans of the operation say that it is not necessarily dangerous in the hands of a skilled operator, nevertheless it is still a serious one and when we reflect that all operators are not skilled, that we have all kinds, good, bad, and indifferent, it must be conceded that the dangers of operation should not be too lightly taken into account.

I may briefly summarize my view as to when the operation should be performed.

The objective indications, may be grouped under two forms: any case of re-infection or of a rapid extension of a chronic otitic process, or whenever a grave complication

is threatened; the indication is then for immediate operation.

The indication is not immediate when the patient suffers little or no pain and there is no striking symptom in the mastoid, but even here the indication may be to operate if the osseous lesion is extensive.

The subjective symptoms, are persistent and recurrent pain in the ear or mastoid process, with persistent and fixed pain in the parietal or occipital region, increased by percussion, which frequently points to temporal or cerebellar abscess.

Vertigo, either permanent or intermittent attacks which may be due to erosion of the external semicircular canals.

Well marked brain symptoms, such as headache, heaviness, pressure, torpor, loss of consciousness, etc.

DISCUSSION.

Dr. Morse: It so happens that I have some photographs here of specimens made a few years ago to exemplify the difference between the ordinary Schwartze operation and the Stacke method and they would seem to bear upon this paper so I will pass them around. The green color indicates the field of operation, the yellow the nerve, the blue the sinus, and you will notice a bristle put through the semi-circular canal while the stapedius tendon and stapes are colored white. These are the main points we wish to avoid. They were devised to illustrate the difference in danger of the two operations. These other two photographs show the Stacke operation. I have some of baby bones also where the field of operation goes immediately down upon the sinus.

Dr. Randall: I think we can often help ourselves by using terms that have a definite meaning and are not so vague as "radical." It seems to me that the term that

Dr. J. Orne Green has given of "tympano mastoid exenteration" will best define what we are doing in many of these operations. The Stacke operation as put forth by Stacke himself has been abandoned by him and is now sometimes confused with the simple Schwartze operation oftener with the Schwartz-Stacke. (Illustrating on the board.)

The original Schwartze operation is a mastoid exenteration. The original Stacke operation consists in an entrance into the attic and antrum from the external canal—it is an exenteration of the tympanum with the soft parts of the canal laid forward. The Schwartze-Stacke does both, in that Schwartze made a hole through the intact mastoid to put in the Stacke protector and succeeded often in paralyzing the facial nerve rather than in protecting it. Küster urged removing always the whole back wall and opening both mastoid and tympanum. In operating here it seems to me if we make a beginning by chiseling in the upper back wall of the canal, 1 cm. from the drumhead making a shoulder here we have the margin of the annulus in front of the facial nerve, and when we have almost completed the opening up of the attic and to a considerable extent of the antrum itself, and not until then, need we break away this protecting bridge. Using the curved chisel with or without the mallet until the bridge has been reduced to a weakness which is no longer a safe-guard we can then with a hook spoon behind it, break it away and carry our work outward as may be required by unexpected caries in the mastoid process. The difference between this and the radical operation, which sweeps away everything here should be kept in mind. If this is called a "tympano-mastoid exenteration" we will understand what we are doing.

I cannot feel that the location of the facial nerve varies much. It is one of the most fixed points we have in the temporal anatomy, though the parts around it may vary

greatly. The oval window must be here (illustrating) and the facial nerve exactly above it and the descent to the stylo-mastoid exit is almost exactly vertical. If you test this on the skull you will find this vertical portion of the facial canal one of the best criteria we have for establishing the normal planes of the head.

REMARKS ON THROMBOSIS OF THE SIGMOID SINUS, WITH THREE NEW CASES.

By E. Gruening, M. D., *New York, N. Y.*

Trautmann pointed out the anatomical pecularities of certain temporal bones which he called dangerous ones. In these bones the sigmoid sinus runs far forward, curves inward, and passes over the projecting ledge of bone forming the posterior boundary of the jugular foramen. The jugular bulb rises toward the floor of the tympanic cavity and lies on a higher plane than the lowest part of the sigmoid sinus. The floor of the tympanic cavity is often as thin as paper; at times it is even dehiscent, and this is due to the encroachment of the jugular bulb. These temporal bones are considered dangerous because purulent inflammation of the middle ear may by contiguity cause thrombosis of the jugular bulb. A case of this nature came recently under the observation of the writer.

Case I. M. R., a child, three years of age, was attacked with scarlet fever on April 18th, 1892. On the tenth day of the disease the child began to complain of pain in the right ear. The temperature, which had been 102° F. a number of days, rose to 104° F., and the membrana tympani was red and bulging. The drumhead was incised and some pus was evacuated. No relief was obtained by the operation, the temperature remained high, and the mastoid process became tender. On April 30 the mastoid was opened. The antrum and the apex cells contained pus and granulation tissue. The internal table covering the sigmoid sinus was quite hard and looked

healthy, and was therefore not removed. The day following the operation the temperature rose to 105° F. and the cervical glands were much swollen. On May 2d, 3d and 4th the temperature was normal, but the deep glands of the neck remained swollen. On May 5th the temperature rose again to 105° F. The family physician attributed this sudden rise of temperature to a digestive trouble. The following day the temperature was very slightly above the normal, and remained so five days. On May 10th, 12th and 14th the temperature rose to 104°, remaining normal on the intervening days. On May 15th the temperature rose again to 105°. Dr. Bacon was called in consultation and it was decided to remove the cervical glands and to expose the sigmoid sinus. This was done. The sinus-wall looked blue and healthy, it was soft to the touch; and it was thought unnecessary to cut into it. After this second operation the temperature fell to 102° and remained at that height until May 22. On that day the temperature rose again to 104°. The ear continued to discharge pus; the sinus wall was covered with apparently healthy granulations and resistent to the touch. On May 26th the temperature rose to 106° F., and it was decided to open the sinus. The granulations covering the sinus wall were removed with a curette and the thickened wall was exposed. An incision one half of an inch in length was made through the anterior sinus wall. A quantity of pus was evacuated from the sinus, but no flow of blood followed. The thickened wall was cut away with scissors; the bone covering the transverse sinus was removed with bone forceps up to a point where the sinus wall appeared normal. A curette was then passed centrally in the sinus and a large clot dislodged. A free flow of blood followed. The curette was introduced into the peripheral end of the sinus and a purulent clot was removed. No blood flowed from below. The jugular

bulb and the jugular vein were exposed. The bulb was filled with a soft clot. The jugular vein was obliterated throughout its whole course in the neck. At a little distance above the clavicle the jugular vein was very much distended and looked blue. The vessel was doubly ligated at that point and cut between the ligatures. It was then dissected out of a bed of cicatricial tissue and followed up to the base of the brain and removed. The dissection was very difficult.

After this operation the temperature fell to normal within twenty-four hours. The child made a good recovery and is now perfectly well.

Case II. On January 20, 1902, I was called to see Miss G., aged 14. She had had an attack of measles from which she was recovering when, on the tenth day of the illness, the temperature rose to 104° and the right ear began to pain. The drumhead was red and swollen in its upper portion. The left ear showed nothing abnormal. The patient had vomited repeatedly that day and complained much of dizziness. She had also marked photophobia and rotary mystagmus. The pupils were small and of equal size. Owing to the constant motion of the eyes a distinct ophthalmoscopic view could not be obtained. The mastoid process was tender both over the antrum and the apex. By incision of the drumhead a small amount of mucus was removed. The next day the soft parts covering the right mastoid process were oedematous and the bone was excessively tender. Dizziness, vomiting, photophobia and mystagmus persisted; the temperature was still 104° F., pulse 110. An immediate operation upon the mastoid was advised, but the prognosis was made very grave in view of the persistence of the symptoms mentioned. Dr. McKernon was called in consultation and had the kindness to assist me in the opera-

tion. The mastoid was of the large pneumatic variety. The cells from the temporal ridge down to the apex were filled with sero-purulent material and granulation tissue in polypoid form. Over the sigmoid sinus, between the outer and inner tables, there were large cells and these were filled with serum. The internal table covering the sinus showed no soft or discolored spot. The bony covering was nevertheless removed and the sinus exposed. The sinus wall looked blue and healthy, and was not incised. After the operation the head symptoms disappeared but the temperature remained at 103° F. On the fifth day after the operation the temperature rose suddenly to 106° F., the head symptoms reappeared, and the patient became delirious. In the presence of Dr. McKernon I made an incision through the sinus wall and evacuated a large quantity of clear serum. When the flow had ceased a large red clot was removed from the central end of the sigmoid sinus, which bled freely. From the peripheric end several pieces of disintegrated clot were removed, but no bleeding followed. The internal jugular vein was then exposed. It was covered by enlarged glands, which were removed. The vein was found to be full of fluid blood. It was ligated and resected. The temperature fell after the operation, but rose again. The patient did not recover consciousness and died two days after the operation. No autopsy could be obtained.

Case III. L. R., aged eight, was admitted to the Mount Sinai Hospital April 24, 1902.

Family History. Negative.

Previous History. Pneumonia at one year of age. Measles a few years later.

Present History. Ill six weeks. Continued to go to school until one week ago. At that time began to vomit occasionally and to complain of pain behind right ear.

Never had a discharge from that ear. Went to the dispensary, where the drumhead of the right ear was pierced. He was advised to go to the hospital. Tenperature on admission 105° F.

Physical Examination. General condition good. Well nourished. Submaxillary and cervical lymph glands enlarged. Marked tenderness over right mastoid process. There is an incised wound in the right drumhead. Membrana tympani and external canal not swollen. Left ear normal. Ophthalmoscopic examination negative.

Lungs—Negative.

Heart—Systolic blowing murmurs over base and apex, most marked over pulmonary area. Apex beat and borders normal.

Liver, spleen, abdomen, extremities—negative.

April 25. Temperature 105° F. General condition same. Tenderness over right ear, swelling below tip.

April 26. Temperature 100° F. Tenderness over mastoid less marked. Tip still tender. White blood corpuscles 19,700. Widal negative. Lungs negative. Temperature rose in the evening to 105° F.

April 27. Temperature 104° F. Patient had a chill. Mastoid tender at the tip.

Mastoid Operation—Gas and ether. Usual incision over mastoid; subcutaneous tissues normal; bleeding rather profuse. Exposed cortex of mastoid appeared normal. Bones very hard; no cells; no antrum found; inner table softened over sigmoid sinus. Sequestrum imbedded in granulation tissue and pus in region of sigmoid sinus. Sequestrum removed, but sinus could not be found. A thin hard cord ran over the surface of the dura in region of sigmoid sinus. In order to identify the sinus the bone was removed in the direction of the lateral sinus. This was found and it was seen that the cord mentioned above was a prolongation of the sinus. The lateral sinus

was opened but did not bleed. More bone was removed, until a part of the lateral sinus was encountered, which bled freely. The peripheric end of the sigmoid sinus was changed into a thin cord, and its connection with the bulb was not exposed. It was deemed advisable to discontinue the operation, inasmuch as the pulse became very feeble and could not be counted. An intravenous infusion of the normal salt solution, ℥xij, was administered with stimulating effect. Temperature 105° F. in the evening; chill.

April 28. Ligature and extirpation of jugular vein. Though the temperature was still high, the pulse was of better quality, and it was decided to ligate the internal jugular vein. Incision was extended downward almost to the clavicle. The vein moved well with the inspiratory impulse, but did not fill from above. It was ligated above the clavicle, divided between the ligature, dissected upward and excised at the jugular foramen. At this point a firm thrombus was found.

The mastoid wound was inspected. The central end of the lateral sinus bled freely. A portion of the necrotic sinus wall was removed and the wound dressed.

April 29. Temperature 99° F. Patient doing well.

May 1. Temperature 100° F. Wound dressed.

May 3. Temperature 100° F. General condition good.

May 5. Temperature 99.2° F. Wound dressed.

May 6. Temperature 98.5 F. First day that temperature reached normal. Patient on full diet.

May 15. Wound granulating. Patient up and about the ward.

May 24. Patient discharged, cured.

DISCUSSION.

Dr. Green: I believe the technique for access to the bulb has not yet been laid down.

Dr. Kipp: I know of two papers published on the subject lately in which the technique is fully described. I have done the operation myself after reading the papers, and do not think it is difficult to do.

Dr. McKernon: I saw the second case the doctor reports. I had seen two prior to that and since have seen a fourth case where when the sinus was opened serum came out for several seconds. I think the clots formed above and below and the fluid elements of the blood were forced out between these two clots. Even where the sinus is opened and no clot found I think if we go down to the jugular bulb and open it there we will often locate the poisonous product and enable our cases to go on to recovery. I have done that within the past four months and the sinus was exposed from about three-quarters of an inch from the bend down to the bulb. There the sinus had lost its elasticity and there was no pulsation in the upper part, but decided in the lower. I opened it with a scalpel and there was a gush of blood from above. I shut it off with a strip of iodoform gauze and there was no hemorrhage from below. I then exposed the bulb, cutting down to it and found both pus and broken down tissue. So I think if we go a little further, as the doctor says, we will often save the case and not have to tie the jugular vein.

Dr. Bacon: I should like to endorse the remarks of the last speaker. I have seen one of these cases with Dr. Gruening and it seemed as if the sinus were perfectly normal at the time. I reported a case some years ago of a boy of eight who had an acute suppurative otitis media. The temperature arose very suddenly, and the symptoms pointed to sinus involvement, but on incising the sinus

there was a flow of blood from each end. I thought, however, that the blood from the lower end did not flow as freely as from above, and passed a curette down to the bulb and gently scraped the sinus. The boy made a good recovery, the temperature going down immediately. I did not tie the jugular in the neck in this case, and it seems to me that where the thrombus has not already broken down it is not right to ligate the internal jugular, especially if the patient's condition is critical. I have had a number of cases since in which I did not have to tie the vein. The latter operation adds very much to the shock and should not be done unless absolutely necessary.

Dr. Randall: In discussing this subject two or three years ago I laid stress upon the point that there is an essential difference between the acute and the chronic tympanic suppurations. In acute otitis the trouble we have to deal with is often a non-septic thrombus and that many of the acute cases are phlebitis alone and not clot and the location is most commonly in the jugular bulb. If a clot is not septic it goes on to organization and closes off the jugular quite as well as though we ligated it; and many of these cases may be safely let alone where due to acute involvement. I have done so with entire success in a group of cases with all the rational signs of phlebitis.

I have found in a number of temporal bones that the juguglar bulb is not only of such size as Dr. Gruening has pointed out but that there is a hiatus through into the tympanum; and I have one temporal where it is so high above the level of the tympanic floor that it trenches upon the internal auditory canal.

Once at least I have had reason to regret that I did not ligate the jugular, which really adds very little to the danger of the case, as is witnessed by the fact that in spite of the greater severity of the condition and of the operation the mortality is less than where it has not been tied.

Dr. Holt: I had a case where the temperature ran up very high, following double mastoid operation, so that the highest thermometers we had, which registered 114°, were broken. One of my consultants suggested taking the temperature per rectum, and we found that when the temperature would be 114° in the mouth it would be subnormal in the rectum at the same time, and then in the course of an hour or more it would change about, being subnormal in the mouth and 114° in the rectum. We broke four thermometers. Thrombus was suspected but not demonstrated. The patient made a good recovery and is well now.

Dr. Andrews: I would like to ask in what proportion of cases the doctor found Gerhart's symptom.

Dr. Gruening: I would mention in closing that in the last case there was immediate improvement in the patient, who had been sick several weeks, with a temperature of 105° and down to subnormal and who immediately recovered after cleaning of the bulb, as the chart shows.

In some cases there is no bulb at all, especially where the sigmoid sinus is very far back, the course of the sinus and jugular being almost straight. It is very likely that in those cases where the floor of the cavity is so thin the infection is carried directly from the tympanic cavity into the bulb.

As to Dr. Andrew's question I cannot answer it as I have paid no attention to that symptom.

THROMBOSIS OF THE SUPERIOR LONGITUDINAL SINUS.

By David B. Lovell, M. D., *Worcester, Mass.*

I wish to read briefly the history of a case that has been of unusual interest to me. From the conditions found at the autopsy, I have made the diagnosis a thrombosis of the superior longitudinal sinus.

Mr. J. F. Q., age 15 years, was first seen by me six years ago. He had a foul discharge from the left ear, which followed an attack of measles three years previous. After about six months' treatment the discharge stopped and I did not see the boy again until April 9, 1902, when I was called in consultation, and found the patient in the following condition, with this history:

The boy had been perfectly well the day before and retired in good health. The next morning he did not feel well, was somewhat nauseated and vomited on two occasions a small quantity of green fluid containing curds. He complained of pain on the left side of his head and began to grow stupid.

I saw him at 1 P. M., when his temperature was 102°, respiration 38, pulse 140. The patient was quite drowsy, had to be spoken to several times before he would answer, and there was only very slight tenderness over the mastoid.

There was no history or sign of any injury, but the parents said the ear had discharged off and on for the past two years. I advised that he be sent to the hospital.

That night his temperature went to 104°, respiration 48, pulse 150 and very feeble. He did not pass urine from

10 A. M. until 3 A. M. the next morning, when he complained of pain over the bladder. He was catheterized and only one ounce was obtained. Analysis viz.: specific gravity, 1021; color, normal; odor, normal; reaction, slightly acid; albumen, a trace. Microscope showed an occasional hyaline cast, rarely a lencocyte, occasional red blood corpuscle, and an occasional free renal cell. He spent a very restless night, and under an opiate slept about three hours.

The next morning he seemed a little better. Temperature 99.$\frac{2}{5}$°, respiration 24, pulse 134. There was some vomiting during the day, 5 ounces in all, and at 5 P. M. he passed 3$\frac{1}{2}$ ounces of urine. Temperature rose in the evening to 103$\frac{3}{5}$°, respiration 28, pulse 140.

The second morning his temperature was 99°, respiration 24, pulse 128, patient more rational, but inclined to sleep, nausea and vomiting continued, kidneys acting better, passed 16 ounces of urine in last 24 hours.

Temperature again rose at night, going to 103°, and patient was very noisy.

His condition remained about the same until 2 A. M. the fourth morning when he first complained of pain in the ear, mastoid tenderness more marked, face flushed, lips and tongue dry. At 10.30 there was a free discharge from the ear mixed with blood, after which I received permission to operate; and at 4 P. M., with temperature 102°, respiration 24, pulse 120, patient was etherized. The operation showed a sclerosed mastoid. The bone was very hard, and I chiseled most of it away, establishing free drainage both ways, but found no pus in the mastoid.

About one inch behind the mastoid free pus was seen beneath the periosteum, yet no perforation of the bone could be found.

I then thought of thoroughly exposing the lateral sinus

but the patient's condition was so poor, it seemed advisable to get him back to bed lest he might collapse on the operating table.

He was freely stimulated after being put to bed, and passed a fairly good night—pulse remaining rapid and feeble.

During the next day he grew stronger, but at midnight temperature rose to $105\frac{2}{5}$, respiration 24, and pulse only 112. Under cold sponging temperature went down and on the second morning after the operation temperature was 99°, respiration 20, pulse 92. His general condition was good, wound was dressed and there was only a slight discharge from the ear.

From this on, the patient did well until the fifth day after the operation, temperature not going above 100, and pulse varying from 100 to 108; he then complained of dimness of vision and pain in the back of the head. There was considerable discharge from the ear, with an offensive odor.

On the sixth day there was some diplopia and pain about the eyes and in the back of the neck. He slept most of the day.

For the next six days patient's condition seemed to improve. He became more cheerful, vision was better, yet pulse still continued rapid and feeble, varying from 104 to 120.

On the twelfth day he complained of deafness, and the next day of pain in the back of the neck and region of the right ear. This was followed by pain in the right side, and difficulty in breathing, which yielded to treatment five days later.

On the nineteenth day he had improved so much that he sat up in a chair for one hour without fatigue. At this time there was still some discharge from the ear. Temperature 99°, respiration 20, pulse 96.

This condition continued for five days, when the patient again complained of headache. Temperature began to rise, and pulse became more rapid, and he no longer cared to sit up, but was inclined to sleep more.

On the twenty-fifth day, the neck below thewound was somewhat swollen and sensitive. The patient complained of severe headache and was slightly nauseated.

The next day vision was poor again, pupils widely dilated, and some pain in right hip. He was quite drowsy. Under ether I opened the neck and found a large quantity of pus, pocket extending down to within an inch of the clavicle.

For the next three days patient again improved and was very cheerful, but the pulse continued weak and did not respond to stimulation. The third night he was very restless, inclined to lie on his back, with knees drawn up, distressed expression on his face, and he complained of pain in the ear.

The next morning temperature was 102°, respiration 24, pulse 118. The patient was very pale and coughed considerably. The next night he became very violent and noisy and at 8 P. M. temperature 101⅕°, respiration 24, pulse 156, the delirium continued and on the morning of the thirty-first day after the operation, he developed a large haematoma of the top and back of the head, which was incised.

The next day he became stupid, passed urine involuntarily, developed internal strabismus, paralysis of right arm and leg, became unconscious, pupils at maximum dilatation, pulse going to 168, and died the afternoon of the thirty-third day after the operation.

AUTOPSY.

On removing the calvarium it was found quite adherent to the dura over the longitudinal sinus at the fissure of

Rolando. There for an area of an inch the dura was discolored and drops of pus were seen on the surface where it had torn from the bone. The rest of the meninges looked normal. On opening the sinus it was found filled with pus throughout its whole length. There was a large thick mass at this point, the rest of the pus being fluid, and on the left side of the thickened mass there had been a perforation of the sinus into the fissure so that a thin layer of pus had formed all along the side of the left hemisphere of the brain. At the torcular herophile the pus was very thin and only a little was found in the left lateral sinus, the right was free from pus. The rest of the brain was normal.

A CASE OF PROGRESSIVE DEAFNESS. INTERMITTENT RIGHT HEMIPLEGIA WITH SENSORY APHASIA. LETTER- BUT NOT WORD-BLINDNESS.

By Herman Knapp, M. D., *New York, N. Y.*

The following case is deemed worth reporting only on account of an intermittent cerebral affection involving the memory centres of sight and hearing. The history, briefly told, is as follows:

A lawyer of Princeton, N. J., consulted me first on Jan. 6, 1879. He was 26 years old and suffered from chronic catarrhal pharyngitis and, on both sides, of chronic dry catarrhal otitis. His hearing was H = 2/24″ and V = R 10/60′, L 20/60′. The impairment of hearing was first noted two years previously. I treated him with gargles, inflation, spraying his naso-parynx, and injecting weak solution of astringents, in very small quantities, into his tubes, through the catheter. After seven months treatment the pharyngitis had somewhat improved, the hearing remained the same. He did not complain of noises.

From that time I saw and treated him occasionally, until after a longer interval he came to me on May 18, 1900, with an entirely different complaint. On April 15, 1898, the right side of his body became paralysed. The tongue protruded to the right, the angle of the mouth to the left. Consciousness and sensation unimpaired. Bladder, rectum, lungs and digestion normal. He was admitted to the New York Hospital, and treated there for three months For a long time he could neither speak nor write, but his hear-

ing remained as good as before. In a year his speech and writing returned gradually: both these faculties are, however, still poor. Longer words he fails to pronounce correctly; he has to repeat them, especially the last syllables, and he has to correct errors in the letters. Sometimes he also fails in the beginning of words, for instance, he utters with an effort and hesitatingly, ...brasca. When asked what is the middle name of Bryan, the democratic candidate for the presidency, he says: Jenn...., ...wren; when he is told, his face lights up and he repeats "Jennings" correctly and with an expression of triumphant satisfaction. If told to write San Francisco, he wrote Sa....n Fr....., and gave it up. His memory is constantly at a loss. He can write several letters, but he cannot read them. I wrote in distinct, but spaced letters, the word "g o o d n e s s." He could not read a single letter, but when I wrote the word "goodness" with the letters connected, he read it immediately. Giving him a law story, he could not spell the words, but when he met a word or a combination of words, which were familiar to him, he read them correctly at once, for instance: "Gentlemen of the Jury."

These are my notes on his case. I gave him a prescription of calomel in broken doses, and asked him to come again, but I have neither seen, nor heard from, him since. A recent letter, addressed both to his office in New York, and to his home in Princeton has remained unanswered.

REMARKS.

The ear disease, the common chronic dry ear catarrh, symptomatically designated as progressive deafness, cannot be brought into causal connection with his cerebral symptoms, which were undoubtedly due to apoplexy, *i. e.* embolism or thrombosis of the middle cerebral artery extending into its fourth and fifth branches.

Let us consider in which way we can utilize these symptoms in the diagnosis of cerebral disease of otitic origin. The cerebral symptoms in our case were

1. Word, or rather letter-blindness, and optical aphasia.

2. Word-deafness—acoustic aphasia. The vision and the structure of the eye had always been normal.

The hearing, though diminished, had been stationary, or at least very slowly on the decline. The optic aphasia, when he presented himself, was of that variety which Dr. Hinshelwood, of Glasgow, has, of late years, so intelligently analyzed, namely the letter-, not word blindness.[1]

This variety was present in our patient in a marked degree. Similar cases have been described, and embodied in H. Ch. Bastian's exhaustive treatise on Aphasia and other Speech Defects[2]; for instance, a case by Wyllie[3]. Kussmaul also distinguishes word- from letter-blindness[4]. Wernicke[5] was the first to locate the lesion of word-deafness into the posterior end of the upper and into a portion of the posterior end of the middle temporal convolution. Kussmaul confirmed Wernicke's determination of the seat of word-deafness, and placed the seat of the lesion in *word-blindness* into the angular gyrus and the supramarginal lobule. These views are still held to-day. Both forms are spoken of as sensory aphasia. Bastian[6] says: "It happens occasionally that the visual word-centre is either congenitally weak, or else has undergone some damage in early childhood, in consequence of which its activity is lowered. This shows itself by an extreme difficulty in teaching the child to read." W. F. Morgan reports a

[1] Chapter V in his book, Letter-, Word- and Mind-Blindness. London, 1899; collected reprints of five cases, with remarks in the Lancet, 1895.

[2] New York, Appleton & Co., 1898.

[3] Disorders of Speech, 1894, p. 340; Bastian's work, p. 194.

[4] Bastian l. c. p. 182.

[5] Der aphasische Symptomen-Complex, 1874.

[6] L. c. p. 180.

case,[1] Nettleship[2] and Hinshelwood[3] have lately also detailed cases of congenital word blindness.

The vicinity of the seats of the visual and auditory memory-centres makes it plausible that both are mostly found diseased in the same person. Their location in the neighborhood of the posterior end of the left Sylvian fissure explains the frequency of sensory aphasia combined with right hemiplegia and right homonymous hemianopsia, the latter being mostly produced by destruction of the underlying optic radiation (of Gratiolet). Otitic cerebral abscesses show these symptoms not rarely, of which the present speaker has published several examples, one of an extensive abscess successfully operated on 9½ years ago,[4] (patient lives and is well), others fatal, with autopsy.[5] Hinshelwood and others report cases, where letter-blindness, or word-blindness, or number-blindness were found as isolated affections, or where they succeeded one another in the course of the disease, also where the memory of one language was obliterated, and that of others remained, even though the obliterated one was the patient's mother tongue. This proves that our memory pictures are registered (deposited) in separate points of the same area. What is found in the visual memory area holds good of the auditory as well. The faculty to understand and repeat written or spoken words, to remember melodies, numerals, etc., depends on the integrity of the memory centres, where each memory-object has its definite place. *There is order in the memory storehouse!*

When one of these special cerebral functions, say sensory aphasia, is found in a patient with a brain complication in ear disease, we know where we have to go in

[1] See Bastian l. c. p. 181.
[2] Ophthalmic Review, March, 1901.
[3] Ibidem, March, 1902.
[4] H. Knapp, Arch. of Otol. XXIII, 1893, p. 155.
[5] Arch. of Otol. XXIX. 1900, p. 46.

search of the lesion, namely, to the acoustic memory centre, three or four cm above the external auditory canal. Apart from this practical standpoint, these researches of the last two decades have opened the way to the fundamental branch of philosophy, viz., experimental psychology. Physicians, particularly ophthalmologists and aurists, will have more to say in that department. Bastian, one of the prominent workers in this field, says: "The auditory and visual images of words constitute our habitual thought centres."

OBSERVATIONS ON ANAESTHESIA OF THE DRUM MEMBRANE.

By George B. McAuliffe, M. D., *New York, N. Y.*

The majority of clinicians do not believe in trying to obtain local anaesthesia of the membrana tympani. Their deductions have been drawn in the main from the futility of using cocaine for this purpose in the external auditory meatus. It is but rational to believe that Nature protects the tympanic cavity from the effects of fluids dropped by chance or design into the external canal. This protection is given by the dermal layer of the drum membrane—a skin without glandular action or hair, acting only as a shield for the layers beneath.

Jacques, by utilizing the selective action of methyline blue, mapped out the nerve plexus in the middle layer of the drum membrane. The nerves spread out in radical meshes from the periphery—mostly from above. In the deeper portion of the dermal layer detached bundles run in different directions and end in apparently sensory end tips.

The mucous membrane of the Eustachian tube and of the tympanic cavity get their main nervous supply from the same source—the glosso-pharyngeal.

From a consideration of these facts we see that the external dermal layer has very little to do with the sensitivity of the drum membrane and that most of the medicines dropped into the ear or applied to the drum membrane have little effect until they nullify the shieldlike action of the skin covering.

The fact that refrigeration does not extend deeply enough to desensitize the membrane demonstrates the truth of the former of the above mentioned conclusions. Furthermore it cannot be localized to the track of the intended incision. The refrigerating sprays need a space of a few inches to secure evaporation. This would bring under its action the whole membrane and canal. I tried to get a tip devised for spraying ethyl chloride on the region of the membrane selected for operation but was not successful. The application of the spray to the sensitive canal and the subsequent thawing are very painful. I have thought that if liquid air could be applied, as it is claimed, by a cotton applicator it would be the ideal refrigerant knife for the membrana tympani. Unfortunately, too, refrigerants interfere with healing and may cause sloughing.

Various preparations like Bonain's—menthol, carbolic acid and cocaine—depending for their action principally on the carbolic acid have been used. More or less success has been reported. I do not believe that the anaesthesia obtained by this class of cauterants is ever complete for reasons given above.

Fluids which disturb the osmotic equilibrium of the drum membrane and produce minute solutions of continuity in the dermal layer, thereby allowing cocaine or its succedanea to reach the nerve filaments are the best we have at present for use in the external canal.

The conditions favoring this application of cocaine are: First—The removal of foreign substances and loose scales from the drum membrane and canal. Second—Dehydration of the outer layers of the membrane—a dessication which causes molecular contraction and interstices through which the anaesthetic can reach the deeper parts and nerve terminations. Third—The induction of endosmosis. The first condition is met by the use of hydrozone which is

stronger and better than peroxide in softening and boiling out the debris of the canal and in lessening the resistance of the dermal layer. The hydrozone is subsequently mopped out by cotton applicators or syringed from the canal. The second and third conditions are met by the use of alcohol and aniline oil. The latter is absorbed more slowly and its effects last longer than the former. The solutions used are 5 to 20% of cocain in equal parts of absolute alcohol and aniline oil. Anaesthesia is gained in 10 to 15 minutes. The disadvantage of the solution is that the aniline oil is toxic and obscures the field. The external canal is generally filled to ensure osmotic instability and certainty of penetration. The toxicity can in great measure be prevented by not filling the canal but by applying to the drum membrane a small wad saturated with the solution and by making only one application. The obscuration of the field by the dark oil will then be less and the solution can be more easily mopped away.

For the last eight years I have experimented desultorily with tubal injections of cocaine to desensitize the drum membrane. I have tried fractional experiments, applying the anaesthetic to the pharyngeal orifice, to the cartilaginous portion, and to the deeper surface of the tube and to the drum cavity by means of a Weber-Liel catheter or a virgin silver modification. I have come to the conclusion that the Eustachian tube is the only channel through which local anesthesia can be best obtained.

In the embryo $\frac{7}{8}$ of an inch long, the drum membrane is represented by connective tissue, bounded below by the external canal which forms its skin covering, and bounded above by the Eustachian tube which forms its mucous covering.

From this embryological formation and from the identity of nerve supply we find the reason for the fact that anaesthesia of the deeper portions of the tube will produce

anaesthesia of the drum cavity and membrane. It may seem like begging the question to state this, but my trials have forced this home to my mind. I do not believe that the five or six minims I blow into the tube are sprayed by the Politzer bag into the tympanic cavity. I think that absorption of the cocaine by the tubal mucous membrane affects the drum and membrane intermediately and by reason of continuity of structure. The fact that cocaine anaesthesia has a field of action of about one inch from the spot to which it is applied would likewise bring the tympanic membrane within the area of tubal anaesthetization.

Unfortunately the lymphatic system of the ear is not well known. If I may be allowed to digress, I think that the production of acute otitis media might be explained more by the theory of absorption from a tubal focus, than of continuity of structure, or by the mechanical one (sometimes urged) of septic matter blown through the tube into the tympanic cavity.

After having forced the cocaine solution into the tube, I have found that in a short time—a time varying in length according to the amount of vascularity present—probing the different areas of the dermal surface of the membrane would occasion little or no distress.

My observations with this method of comparative sensibility do not coincide with those of Dr. Blake, who finds that the areas of the membrane from below upwards and from the umbo backwards increase in movement, vascularity and pain. I have sometimes found a trifle of sensibility at the lower margin of the membrane and at the region of the stapes entire absence of any but tactile sensation.

These facts and observations on atrophic drums have shown me: First—That the dermal layer need not be considered in local anaesthesia of the membrane and does not play so great a part in sensation as the mucous layer,

since palpation of the skin surface does not elicit pain, although the cocaine reaches only the mucous membrane. Second—That the pain in palpation does not result from the local impact, but from the excitation of the whole sensory apparatus of the tympanic cavity, induced no doubt by the sudden abnormal inward movement of the drum contents. Third—That the pain of incision depends on the pressure made on the drum membrane by the knife as much as on the cutting. Fourth—That the incision should consequently be made with the minimum of inward pressure and with as sharp and as thin a knife as practicable. This explains why incision in the membrane is made so much easier by the use of the Graefe knife than by the poor knives made especially for the work-knives, whose smallness of blade precludes sharpness of edge. Fifth—That in order to produce the best results in this method of anaesthesia isotonic or iso-osmotic solutions of cocaine should be used in order to avoid oedematization of the tube and subsequent otitis media.

SUPPLEMENTARY REPORT ON A CASE OF DOUBLE STAPEDECTOMY OPERATED UPON TEN YEARS AGO.

By Frederick L. Jack, M. D., *Boston, Mass.*

The case is one of a number reported at the meeting of this Society, July 20, 1892. It is an interesting one not only on account of the effect of the operation on the hearing, but because it is probably the only instance of a person without a stapes in either ear.

The patient is a girl 20 years old. The impairment of hearing was the result of a chronic non-suppurative inflammation in both middle ears. The left was the worse and the first one operated upon. The improvement in the hearing was so great that two months later, at her request, the right stapes was also removed.

At the time of my original report it was suggested that probably time would diminish the improvement in hearing if it did not destroy it altogether. On the contrary ten years have elapsed without apparent diminution.

During this time the case has been under observation, and was last seen in May, 1902. General conversation, also hearing for all ordinary sounds has been good, whereas previous to the operation it had been bad. The drums have remained healed. The portion covering the seat of operation is somewhat sunken, forming a movable membrane over the oval window. There are no signs of increased changes in the middle ear. This case in the light of our present knowledge is unique.

I take this opportunity to state conclusions based on the past ten years of investigation.

1. Removal of the stapes does not destroy hearing but sometimes improves it. The contrary statements found in most text books up to the time of my paper were incorrect.

2. The operation upon the profoundly deaf is not advisable. This opinion is based upon seventy cases. In this class of cases as a rule the bone cannot be removed and if it were the chances are that no improvement will follow, as the sound perceiving apparatus has undergone irremediable changes.

3. Removal of the stapes as a perfectly justifiable procedure in certain cases of distressing vertigo (Meniérès disease) after all other means have failed.

4. Operation upon cases of moderate deafness may give brilliant results but is attended wtth some risk to the hearing.

DISCUSSION.

Dr. Johnson: I would like to know how many operations for removal of the stapes the doctor has done in the last year.

Dr. Jack: None.

THE VALUE OF BACTERIOLOGICAL EXAMINATION OF THE DISCHARGE IN ACUTE OTITIS MEDIA AS DETERMINING THE NECESSITY OF OPERATIVE INTERFERENCE.

BY EDWARD BRADFORD DENCH, M. D. AND FRANK M. CUNNINGHAM, M. D. *New York, N. Y.*

In presenting this paper to the Society, I beg to say that personally I have had practically nothing to do with the bacteriological side of the question. For this portion of the paper I am indebted to my present House Surgeon, Dr. Cunningham, for a most careful and exhaustive search through the records of the hospital during the past few years. For the bacteriological examinations comprised in this report, I beg to acknowledge my thanks to Dr. George S. Dixon, Assistant Pathologist to the New York Eye and Ear Infirmary, who has devoted a large amount of time to making a careful bacteriological examination of all specimens presented to him.

It should be borne in mind that in order to determine the comparative virulence of the several bacteriological infections which may appear in acute inflammations of the middle ear, an accurate conclusion can be reached only by means of careful and comprehensive study of a large number of cases. To this end, and at the expenditure of much time and care, a thorough search has been made of the record of cases which have come under treatment, operative or otherwise, at the New York Eye and Ear Infirmary, since 1897, in which a microscopical examination of the discharge from the ear has been made. It

is apparent that no cases which have passed the stage commonly called "acute", could in any way be available or useful in the compilation of this report. Only those cases, therefore, which came under observation during the stage of acute inflammation have been selected for this resume. This communication makes no pretense to originality, but simply strives to emphasize a most important division of cases of middle ear suppuration, with mastoid symptoms, into two separate and distinct types: the one in which operative interference upon the mastoid is almost invariably demanded, and the other in which interference may be safely delayed for some time, in the hope of aborting the acute symptoms by non-operative measures. It seeks to show that the greatest significance and stress should be placed on the nature of the infective coccus as shown by microscopical examination, enabling one from the knowledge thus gained to make, in a particular group of cases, a reasonably certain prognosis of recovery, by the local application of cold; while, in the other group, immediate operation, of the most thorough character, is demanded.

It becomes a matter of considerable moment then, to establish an accurate bacteriological diagnosis in every case of acute middle ear suppuration, with symptoms of mastoid inflammation, no matter what the exciting cause of this inflammation may be, in order to determine at the earliest possible period the probable necessity for operative interference. In many cases, the clinical history will show that the acute middle ear symptons are secondary to some severe constitutional disease, such as one of the exanthemata, or any of the acute infectious diseases. Occasionally, however, the inflammation within the middle ear will develop insidiously and will remain latent, the symptoms being so obscure as to attract very little attention. In these obscure cases, much can be learned from a careful

microscopical examination of the discharge from the ear. In every case of purulent inflammation of the tympanic cavity there must necessarily be a certain amount of involvement of the mastoid antrum. In all of these cases it would seem that when these symptons of mastoid involvement first appear, we are justified in using palliative measures, such as the local application of cold to the mastoid, for the relief of involvement of the bony structures. Such local application should naturally first be preceded by thorough sterilization of the external auditory canal and of the tympanic cavity as far as possible, and securing free drainage of the middle ear by an extensive incision of the drum membrane, carrying this incision outward on the upper wall of the canal for a considerable distance in order to relieve tension in the mastoid antrum. After such free incision has been made, perfect asepsis of the canal should be maintained by frequent irrigation, employing a mild antiseptic solution, such as a solution of bichloride of mercury, of a strength 1 to 5000. The local application of cold should not be persisted in for a longer period than 48 hours, and usually for not more than 36 hours.

The appended report of cases, which have come under observation at the New York Eye and Ear Infirmary, shows very clearly that in one set of cases, the inflammation of the middle ear and mastoid, if taken in its incipiency, will disappear under such treatment; while in another set of cases, no matter how early the case is observed or how vigorous the treatment may be, the symptoms will increase in intensity and the disease will continue to advance until extensive involvement of the mastoid has taken place.

The report appended will show that in all cases of of streptococcus infection, there was a tendency for the inflammatory process to extend rapidly to the osseous structures. This statement applies only to those cases

which came under observation within ten days after the appearance of the first acute symptoms. After this time, no matter what the infection may be, the inflammatory process has extended to the mastoid and pus has formed within the mastoid cells; the only possible way of affecting a complete cure is by the evacuation of the pus by a thorough operation.

According to the hospital statistics compiled and presented in this paper, those cases of mastoiditis in which the acute symptoms disappeared as the result of abortive treatment, such as free incision of the drum membrane and the local application of cold, were almost invariably due to the diplococcus pneumoniae: in other words, the presence of the pneumococcus as the sole etiological factor, signifies a rather mild form of inflammation in the mastoid cells.

In those cases of pneumococcus infection, with three exceptions, in which operations were performed, the mastoid tissue was certainly more preserved than was the case when any other infectious organism was present. In two cases in which severe clinical symptoms were present, neither pus nor granulation tissue could be found in the mastoid cells. The bone, in these cases was found at the time of operation to be intensely congested, and it seems fair to presume that this intense congestion might have disappeared upon the local application of cold. On the other hand, it has been most interesting to note the rapidity with which the streptococcus infection develops. In cases where this form of infection has been present, the osseous structures have been found at the time of operation to be extensively involved, even in those cases which have been operated upon in the very earliest stages of the disease. In many cases in which the inflammatory process had existed but from forty-eight to seventy-two hours, extensive destruction of the bone had taken place. In quite a number of these cases, but few local symptoms were present,

the most prominent being a sagging of the upper and posterior wall of the meatus, obscuring a view of the corresponding portion of the membrana tympani.

Having this study in mind, we have been careful to follow those cases of streptococcus infection which have apparently cleared up, in which the mastoid inflammation has apparently been aborted by the application of cold and by the milder methods already suggested. In four cases which have occurred since January 1st, 1902, the patients have returned, complaining of a recurrence of the local pain, and with some slight, greenish-yellow, purulent discharge from the ear. On returning for treatment the patients have been pale and apathetic, presenting the appearance of general sepsis. In these cases, upon operation a most extensive destruction of the bony tissue has been found. In three cases epidural abscess has been present, and in a fourth case thrombosis of the lateral sinus existed at the time of operation. It is not to be understood that this rule is absolute, and that every case of streptococcus infection of the middle ear must be subjected to an early operation upon the mastoid. It must be remembered that in a few cases prompt treatment of the middle ear by free incision of the drum membrane and frequent irrigation of the canal will lead to a resolution of the inflammatory process without extension to the mastoid. It is unwise, however, in cases of streptococcus infection, to attempt to abort extension of the inflammatory process to the mastoid by the local application of cold. If free drainage and surgical cleanliness do not cause the mastoid symptoms to disappear at the end of forty-eight hours, immediate operation is demanded in these cases. The use of ice in cases of streptococcus infection is, I believe, absolutely unwarrantable, and this, I think, is clearly shown from the statistics which will follow. The same statistics will show that where a mild infec-

tion, such as that of a pneumococcus exists, abortive measures may, in quite a large proportion of cases, be relied upon to prevent serious mastoid involvement. In cases of mixed infection, in which the streptococcus is present, the same rule holds—the majority of cases will require operation. In cases of mixed infection, with no streptococcus, considerable reliance may be placed upon abortive measures.

Nature of Infection.	No. Cases.	Ice-Coil.	Operation.	No Operation
Streptococcus (pure),	33	17	28	5
Staphylococcus,	3	3	2	1
Pneumococcus,	21	21	2	19
Mixed infection *with* streptococcus present,	25	19	23	2
Mixed infection, with *no* streptococcus present,	9	9	3	6

Under "Pneumococcus" are included those cases in which the infecting organism was a diplococcus, resembling closely the "pneumococcus," but not of sufficiently definite character to state positively that it was the true "pneumococcus."

RECOVERY.

	Ice-Coil.	Operation.
Streptococcus,	14 %	86 %
Staphylycoccus,	$33\frac{1}{3}$ %	$66\frac{2}{3}$ %
Pneumococcus,	90 %	10 %
Mixed with streptococcus,	8 %	92 %
Mixed, no streptococcus,	$66\frac{2}{3}$ %	$33\frac{1}{3}$ %

A PIECE OF BOUGIE IN THE EUSTACHIAN TUBE.

By J. Oscroft Tansley, M. D., *New York, N. Y.*

April 16, 1902, Miss Annie F——, come complaining of trouble with her ear, and gave the following history:

"About February 15th last she had a noise or ringing in her left ear, which was considerable and quite annoying, and affected her hearing to a considerable amount. She was advised to consult an aurist here in New York, who, after examining her ears, said that she had catarrh of the middle ear and stricture in the left Eustachian tube. He used an air bag, putting the nozzle into her nose, but was unable to make the air enter her ear as well as he said that he desired, and told her that it would be necessary to use a probe and electricity to take away the obstruction.

"He used cocaine in her nose so that she would have no pain. The operation upon the first visit was not very successful, she said, and was quite painful, notwithstanding the use of the cocaine. She was treated by the doctor for four weeks, making three visits each week, the treatments each time consisting in passing a tube into her nose and then passing a gold wire through the tube into her ear and connecting the wire with the electric battery. Sometimes there was considerable pain, at others not as much. The treatment seemed to relieve the noises and improve the hearing.

"At one of the visits during the last week of treatment he caused her to have considerable pain and when he removed the tube and wire he appeared to be consider-

ably disturbed, but as he said nothing she could not ascertain what it was that disturbed him, but she thought that the passage of the wire was not satisfactory to him.

"She only made two visits after the time when it hurt her so much, and the doctor did not use the wire at these two visits, only sprayed her throat and treated her ear. The deafness returned and the noises became worse and she had pain in the ear. She had received no treatment since, and as her ear pained her more than it had previously, she had been induced by a friend to see me, and if I could not do her any good she wished me to tell her so, but she did not want any more wires passed into her nose."

Examination:

H. D. R. = watch 6 feet.

H. D. L. = watch 2 inches.

Right ear—Canal normal. Lt. spot displaced upwards and forwards, and a mere spot, not triangular. Action to Siegles fairly good.

Left ear—Canal normal. Light spot absent. Drum hyperaemic, particularly supero-posteriorly, and a distinct leash of vessels passing down the manubrium. Slight pain upon lifting the external end of the canal; no evidence of secretion in the tympanic cavity.

Diagnosis.—Subacute inflammation of the maleo-incudal articulation.

I lightly used the Siegles otoscope but as it caused unpleasant feeling akin to pain I desisted.

Naso-pharynx showed some irritation but no secretion beyond normal. Right Eustachian tube apparently normal. Opening of left tube contained some whitish mucus.

For some time I had made it a routine procedure in examining patients whose ears had been previously treated to examine very carefully both by inspection and palpation the openings of the Eustachian tubes, because I had

heard of several cases in which the end of the electrolysis probes had been broken and lost.

I had no reason to suspect that such was the case with this patient, but, following my usual course, I examined the tubal openings carefully, and upon seeing the mucus in the tube I sprayed it liberally with an alkaline solution and wiped the cavity out with a bit of cotton upon a long probe through the anterior nares, inspecting it meanwhile with the small rhinoscopic mirror posteriorly.

When the mucus was removed I saw something which excited my curiosity, and upon palpating or touching it with a metallic probe I had the metallic sensation.

The patient was an unusually docile one, and these examinations were made easily after cocaine had been sprayed and sopped upon the parts.

The inferior turbinated was closely applied to the temporal side of the nares, and when the tissues had been shrunken with cocaine and suprarenal extract I could almost see the Eustachian opening through the anterior nares, and I could easily inspect the tube through the posterior nares, and the "something" which excited my curiosity and gave the metallic sensation appeared posteriorly as a small spot protruding from or in the opening of the tube.

Having the patient's head held rigidly and while inspecting the Eustachian tube posteriorly, I passed a delicate pair of polypus forceps through the nose as you would a catheter, and again had the distinctly metallic sensation, and upon my third attempt I withdrew the bulbous point or end of an electrolysis probe about three fourths of an inch long.

I had not told the patient what I was trying to do, excepting to say that I was trying to clean the tube of the obstruction which was troubling her ear, and when I secured the piece I laid it on my desk after having inspected

it carefully in the adjoining room, and I have never seen it since. I suspect that the patient stole it, for I shortly was called out of the room for half an hour or more, but I have refrained from asking her for obvious reasons. The subsequent treatment of the case was exosmotic sprays, massage of the drum, derivative applications to the external canal, politzerization, etc. Soon the air passed easily into the middle ear, and to make a long story short after about four weeks' treatment, the irritation to the drum membrane had all passed away, no more pain was experienced and the hearing came up to 6/12 the same as in the right ear. The patient was pleased and I have not seen her since.

I hesitated considerably before I decided to present this case to the Society but it seems to me that these cases should always be presented, and any treatment or mode of procedure that cannot bear investigation should not be countenanced at all.

The electrolytic treatment of the Eustachian tube is a new mode of procedure but it has been used many years in the urethra where the technique is much more simple and easy. The urethra, from the very nature of its duties, is more used to rough usage, abuse and traumatism, and will not resent so quickly the use of the bougie, electrolytic or otherwise, and still the electrolytic treatment of its strictures is not accepted by the best or the most of the specialists in this branch. Years ago I abandoned the use of bougies in treatment of the Eustachian tube because I found better results with treatment which involved less of danger. I have even gone so far—as many of you know—as to say that the catheterization of the tube does more harm than good by forcing up microbes, causing irritation, stricture, and bands of adventitious tissue where they had not previously existed.

I have used electrolysis but my results were very poor

indeed, and they are practically useless to chronicle, be cause of my prejudice against it. I used it without the slighest hope of success.

My friend, Dr. Thomas J. Harris of New York, read a very instructive paper before The American Laryngological, Rhinological and Otological Society, May 24, 1901, in New York, entitled "A Year's Experience in the Treatment of the Eustachian Tube by means of the Electro-bougie," and I would earnestly advise its perusal. I cannot review his paper wholly but will simply quote his results.

In 33 cases treated, 26 had tinnitus; of these
- 1 was cured.
- 13 improved.
- 12 not improved.

Of these 13 improved
- 2 were much relieved.
- 9 partially so.
- 1 much relieved but no stricture present.
- 1 temporarily relieved.

Of the 2 cases reported as cured, 1 has not been seen afterwards, and 1 patient returned at the end of four months with tinnitus as bad as ever.

Seventeen of the 33 cases complained of hard hearing.
- 12 improved.
- 5 not improved.

Of these 12 improved cases
- 3 only slight improvement.
- 3 from 3 inches to 6 feet.
- 6 from 4 to 12 feet.

In short real benefit to hearing was made in 8 of the 19 cases, but later examination of 2 of these 8 cases shows all improvement lost.

His final conclusions are as follows:

1. The electro-bougie has a place in aural surgery, though less than was at first supposed.

2. It should be used after and not before other methods.

3. It will be most liable to fail if any associated internal disease is present.

4. Its results are not always permanent; we may hope for a diminution rather than a disappearance of the tinnitus.

5. Its use is not without danger.

6. It is a question whether the process is a true electrolytic one or if in many cases the obstruction is a true fibrous one.

You will notice that his final conclusions are far from being enthusiastic, but eminently just.

My experience with the bougie in years past and my more recent experience with the electrolytic bougie has induced me to come to the conclusion to let it alone except in very exceptional cases, and in my office the bougie is not used more than once or twice a year, and the catheter very seldom, and when I do use the catheter I always use that excellent procedure of Dr. Dench of a piece of piano wire with a bit of cotton upon the end. This wipes out the tubal opening and affords a means of making such applications as may be desired, but I do not consider it a probe or bougie in any sense of the word.

My office is not an experimental one, and I dare not and have no desire to incur any risks in treatment.

Previous to the case which occasions and precedes these remarks, I had not read Dr. Harris' paper upon the subject, and had heard only the rumor of the breaking of bougies.

In speaking of the dangers of this treatment Dr. Harris says as follows: "Care was exercised in each case to secure as thorough asepsis as possible. In spite of this, suppuration of the ear followed in four cases."

That is, suppuration in 12 per cent. of the cases.

Three of these cases were attended by no unpleasant sequelae, but one case passed on to a mastoiditis and he found it necessary to open the mastoid five days after the electrical treatment. Again he says: "Recently we have heard of still another complication. In two cases in the hands of an experienced competent man the bougie has broken off *in situ*."

Knowing the honesty, capability and carefulness of Dr. Harris, his words speak volumes to me, and I hope they will speak equally loud to others.

THE CARDIAC AND VASCULAR EFFECTS OF OPERATIONS UPON THE MIDDLE EAR.

By H. O. Reik, M. D., *Baltimore, Md.*

The writer has frequently noticed in operating upon the tympanic membrane that although the pain was very slight, or at least was well borne, the patient complained of a sense of depression, weakness and sometimes faintness. The same condition has occasionally accompanied so small an operation as the syringing of an ear for the removal of cerumen or a foreign body, and on two occasions a patient has fainted immediately after receiving the first syringeful of water, although it was injected with care. Gruber, speaking of injuries to the healthy tympanic membrane, says: "The acuteness of the pain, with the feeling of alarm, sometimes causes fainting, even though the deeper structures are uninjured. Occasionally convulsions and other nervous seizures make their appearance, especially in hysterical subjects." Such experiences and many others of a similar nature, have occurred to all of you, and the only excuse for referring to the matter here is a desire to suggest a new explanation for the phenomena and to consider the possibility of their avoidance.

The generally accepted explanation of this syncope or collapse, which is sometimes marked and always annoying, is, I believe, that it is due to excessive pressure exerted upon the membrane and transmitted through the ossicles to the internal ear, where, by its influence upon the organ of equilibration, it produces a condition akin to nostalgia. While this may be satisfactory in many cases it is certainly not applicable to all if even to a majority.

For instance, in using the aural syringe it is difficult to regulate the amount of force one is employing and the entire membrane may come under the influence of the pressure, but when doing a paracentesis the knife ordinarily pierces the membrane at some little distance from the manubrium, so that only a fractional part of the limited pressure exerted could possibly be transmitted to the stapes, and, when excising the membrane, as in ossiculectomy, little or no weight could be laid upon the ossicles because the incision is made in the periphery and follows closely the annulus.

The cardiac and vascular depression which accompanies so many of these operations then requires a better explanation. At the suggestion of Professor Howell, and under his guidance, I undertook a series of experiments in the Physiological Laboratory of the Johns Hopkins University to determine whether mechanical stimulation of the tympanic membrane had any specific effect upon the circulation, as shown by variations in the blood pressure and pulse rate.

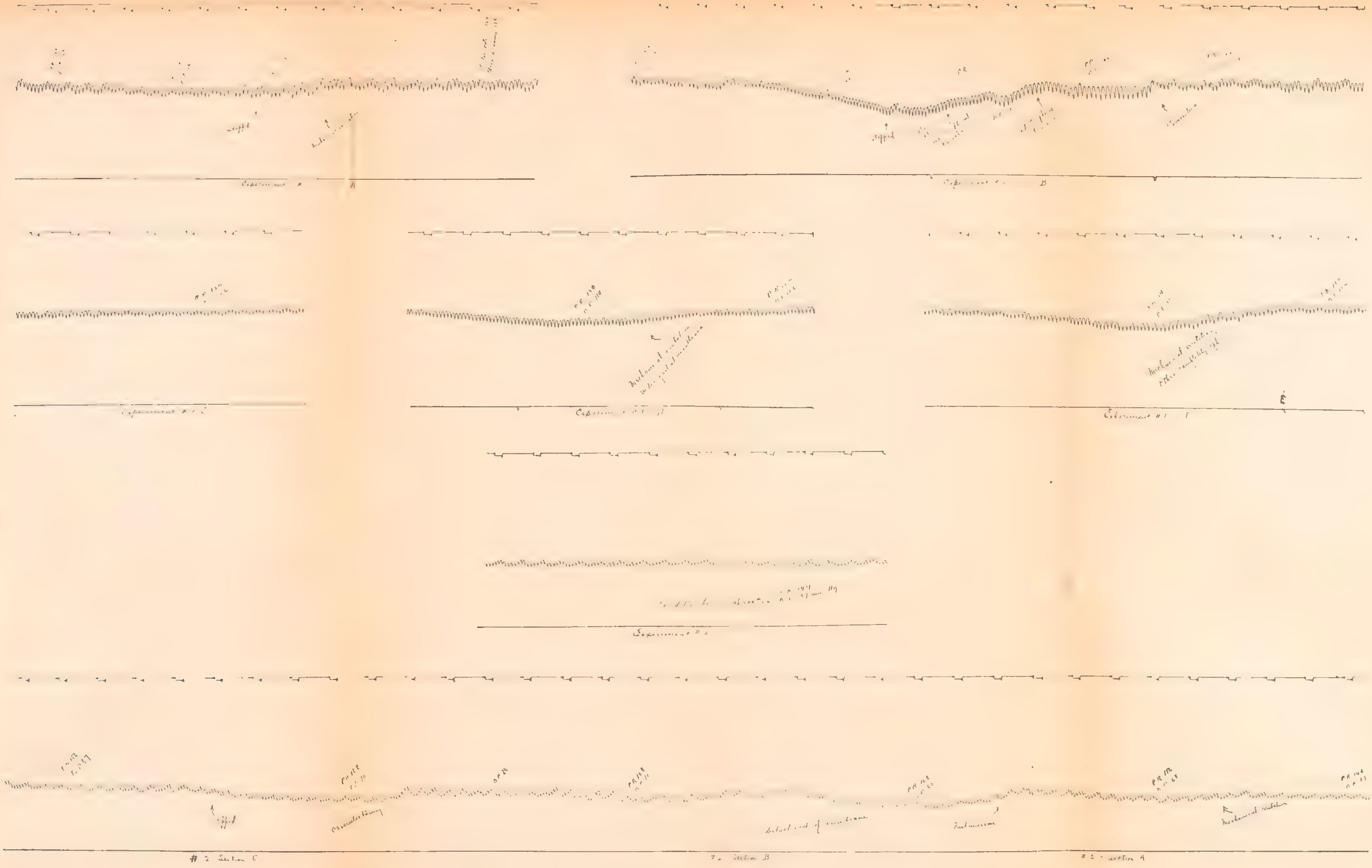
Experiment. No. 1. A healthy medium sized dog was prepared for the kymographion in the usual way, viz:— after the hypodermic administration of one grain of morphia, ether was administered, a tracheotomy performed for the attachment of an ether apparatus that enables the animal to continue his own anesthetization, and a canula was inserted into the femoral artery. The anterior cartilagenous wall of the external auditory canal, on account of its long tortuous course in the dog, was divided to permit the better introduction of a speculum and more satisfactory exposure of the tympanic membrane. The recorder showed the pulse rate to be 120 per minute and the blood pressure 126mmHg. The accompanying illustrations show graphically the effects of the manipulations I shall describe.

A. The ether bottle was now disconnected and when the animal had recovered to a condition of lighter anaesthesia the membrane was subjected to mechanical irritation by forcible rubbing with a blunt probe. The effect was immediately shown on the recorder as a drop in blood pressure with evidences of cardiac inhibition; the pulse rate fell from 120 to 114 per minute and the blood pressure from 126mm to 114mmHg. When the irritant was withdrawn the pulse arose rapidly to 126, then settled back to 120, and the pressure ascended steadily to the normal of 126mmHg. (Fig. No. 1-A.)

B. With a sharp paracentesis knife the tympanic membrane was now punctured and then cut all round the periphery, as in the operation of ossiculectomy. The result described above was again noted but much intensified. With the puncture there was a sudden drop of pressure to 110mm; with extension of the incision from the posterior upper part down to the lower periphery it fell further to 100mm; and, with a second incision anteriorly, to complete detachment of the membrane, it dropped to 85mm. Meanwhile the pulse had fallen suddenly to 102, from 120 at the begining of the operation, reacted to 120, then increased with the other incisions to 132 and 144, and finally, with the cessation of operative work, returned slowly to 120 as the blood pressure likewise returned to normal. (Fig. No. 1-B.)

C. Resuming the administration of ether now until the dog was again profoundly anesthetized the mechanical irritation of the malleus and deeper parts of the tympanic cavity was repeated with the blunt probe without effect on either pulse or pressure. (Fig. No. 1-C.)

D. Allowing the ether to wear partly off such irritation was continued, with a faint recurrence of the results noted in experiments A and B. The pulse rate remained undisturbed but the pressure fell to 110mmHg. (Fig. No. 1-D.)



E. With ether more completely worn off and stimulation continued the effect was increased. (Fig. No. 1-E.)

Experiment No. 2. This was performed in the same manner as the first, as a matter of confirmation, with the results shown in Fig. No. 2, sections A, B and C. At the outset the blood pressure was 87mmHg, and the pulse 144 per minute.

Section A represents the effect of mechanical irritation of the membrane with a blunt tube. Section B—the excision of the membrane, and Section C removal of the malleus. It will be noticed that the blood pressure fell to 68mm during the rubbing, then arose to 87mm but dropped sharply to 60mm with the first cutting and varied between that and 70mm throughout the operation; returning at the close thereof to 87mm. The effect upon the pulse rate, however differed from the first experiment in that instead of cardiac inhibition we got a slight acceleration, rising from 144 to 168 per minute. This may be explained by the fact that this animal had been used for another demonstration and was under ether continuously for several hours before delivery to me.

Experiment No. 3. The attempt was made here to ascertain the cardiac effect when the operation was performed under complete local cocaine anesthetization. As the ether was withdrawn a 10% aqueous solution of cocaine was applied to the membrane and these drops were renewed every two minutes until six applications had been made. The blood pressure was then 94mmHg and pulse 114. A simple paracentesis was done and the pressure dropped to 90mm, the pulse rate to 108; a very slight change as compared with the effect without any anes thetic. The experiment was performed on both ears of this dog and repeated on both ears of a second animal with always the same result.

The results of these and similar experiments tend to

show that the faintness and other effects which attend operations upon the tympanum are due mainly to disturbance of the vaso-motor apparatus, through irritation of the sensory nerve supply: that these nerves when stimulated show a depressor effect and usually a cardio-inhibitory action, though under some circumstances the pulse rate may be increased; and, that complete anesthesia prevents the transmission of such an influence by these nerves and partial anesthesia weakens this influence.

The first conclusion was unexpected. Stimulation of a sensory nerve branch when the animal shows no shock, usually produces a pressor effect, that is, a rise in blood pressure. Whereas with the sensory surfaces under consideration the pressor effect is entirely absent and a marked depression of vascular tone is seemingly the invariable result. The effect resembles that described in operation on the testes.

The only practical lesson to draw from this work perhaps is the inference that complete anesthesia should be induced prior to any middle ear operation. I should not wish to be understood as advocating that plan because the gain referred to might often be more than counter-balanced by the dangers and discomforts of the anesthetic. I would call your attention, nevertheless, to the recently revived interest in the employment of gas. It is now being used regularly in some of our best hospitals and it has been found possible to keep a patient safely anesthetized for a half hour or longer. It would seem peculiarly well adapted to much of our work, is easily administered with the patient in any desired position, completely anaesthetizes and is practically harmless.

DISCUSSION.

Dr. Randall: The applause indicates the extreme interest we all take in this subject, and while I certainly do

not feel ready to enter into any discussion of the matter now, I want to say that it undoubtedly offers us much to think over, and probably very practically to apply.

Dr. Bacon: I would like to ask Dr. Reik whether in the administration of the gas he uses oxygen with it. I use gas a great deal in minor operations and have found it advantageous to use it with oxygen. Otherwise in opertions on the drumhead the appearances of the membrana tympani become greatly changed from the dark color of the blood.

Dr. Howe: The method pursued by Dr. Reik suggests the fact that it is possible to obtain a numerical expression for the degree of anaesthesia produced by cocaine. The method of accomplishing this was published by Dr. Howe in Knapp's Archives several years ago. Only one who has attempted to make measurements with the Kymograph can appreciate the time and patience necessary in any such studies.

Dr. McAuliffe: It strikes me that this depressor effect might be more rationally explained by attributing it to irritation of the vagus.

Dr. Reik: In reply to Dr. Bacon, I have not had any personal experience with the use of gas. I have seen it used in the Massachusetts Eye and Ear Hospital, and at the Johns Hopkins, where they have used it extensively in gynaecological work. They used the pure gas. They experimented with its use in combination with oxygen and came to the conclusion that it was more satisfactory when used alone.

As to the matter of the vagus, I do not consider that it plays any part in the experiments. There are connections in the posterior wall of the canal between the small branches of the vagus and the ariculo-temporal, but so far as I know there are no branches of the vagus in the tympanic membrane nor in the tympanum except on its internal wall.

We took great care not to stimulate the wall of the canal. We also tried to ascertain if the chorda tympani played any part and found that it could be entirely eliminated.

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TRANSACTIONS

OF THE

AMERICAN OTOLOGICAL SOCIETY,

THIRTY-SIXTH ANNUAL MEETING.

WASHINGTON, D. C.

MAY 12 and 13, 1903.

VOL. VIII., PART II.

PUBLISHED BY THE SOCIETY:
MERCURY PUBLISHING COMPANY, PRINTERS.
NEW BEDFORD, MASS.
1903.

Extra copies may be had by addressing the secretary, Dr. F. L. Jack, 215 Beacon Street, Boston, Mass., or Mercury Publishing Company, 112 and 114 Union Street, New Bedford, Mass.

DR. OREN DAY POMEROY.

In Memoriam.

Dr. Oren Day Pomeroy, one of the charter members of this society, died at Whitestone, L. I., on March 19th, 1902. He was a good representative of that industry, thrift, and integrity which has made the sons of New England famous throughout the civilized world. Born in Connecticut he was graduated from the College of Physicians and Surgeons in the City of New York in March, 1860. He was appointed by Dr. C. R. Agnew Assistant and Chief of Clinic of the Eye and Ear Department in that institution at its beginning in 1866; was assistant surgeon in the Manhattan Eye and Ear Hospital from its foundation until 1873, when he was elected a surgeon and director, and held that position till his death. He was consulting physician to the N. Y. Foundling Asylum, the Paterson Eye and Ear Infirmary, and held the chair of Ophthalmology at the Northern and Dewitt Dispensaries for various periods. He was Professor of Otology in the New York Polyclinic from 1883 till 1901, when he became Emeritus Professor and continued such till the end of his life.

He always took a great interest in the American Otological Society and was at one time its president.

He was also a charter member of the New York Otological Society, and resigned his membership there a short time before

his death, owing to his inability to attend his duties in that direction.

Dr. Pomeroy was the author of many essays and papers bearing upon the subject to which he was so devoted, and a text book on Diseases of the Ear which was adopted as a guide by many medical schools immediately on its publication, and which marked the transition period, if it might be so stated, between the old school and the modern or perhaps heroic school of treatment.

He was a loyal friend, a generous enemy, the soul of punctuality, and we shall miss his cheery smile, his wise counsel, and keen insight. With a stainless record his surviving friends may well wish that when the end shall come, it may come as calmly, peacefully and pleasantly as it did to him whose loss we mourn.

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Dr. F. Whiting, ... 47 West 50th St., ... New York, N. Y.
Dr. W. H. Wilmer . . . . 1610 I St., N.W., . . . Washington, D. C.
Dr. F. M. Wilson, ... 834 Myrtle Av., ... Bridgeport, Conn.
Dr. Hiram Woods, . . 842 Park Av., ... Baltimore, Md.

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* Associates.

† Temporarily at Santa Barbara, California.

American Otological Society.

The Thirty-sixth Annual Meeting of the American Otological Society was held at the Arlington Hotel, Washington, D. C., Tuesday and Wednesday, May 12th and 13th, 1903. The meeting was called to order at 10.15 a. m. by the President, Dr. B. Alex. Randall.

The following members were present;

Drs. A. E. Adams	Newburgh, N. Y.
John L. Adams	New York, N. Y.
Gorham Bacon	New York, N. Y.
T. P. Berens	New York, N. Y.
Wm. S. Bryant	Boston, Mass.
Jas. B. Clemens	New York, N. Y.
Eugene A. Crockett	Boston, Mass.
E. B. Dench	New York, N. Y.
Wells P. Eagleton	Newark, N. J.
J. B. Emerson	New York, N. Y.
George Fiske	Chicago, Ill.
John Green	St. Louis, Mo.
E. Gruening	New York, N. Y.
Thomas H. Halsted	Syracuse, N. Y.
Philip Hammond	Boston, Mass.
Neil J. Hepburn	New York, N. Y.
E. E. Holt	Portland, Me.
Frederick L. Jack	Boston, Mass.
Walter B. Johnson	Paterson, N. J.
Herman Knapp	New York, N. Y.
Geo. Leland	Boston, Mass.
John C. Lester	Brooklyn, N. Y.
Frank N. Lewis	New York, N. Y.
Robert Lewis, Jr.	New York, N. Y.

Drs.	Wm. Lincoln	Cleveland, O.
	J. A. Lippincott	Pittsburg, Pa.
	F. B. Loring	Washington, D. C.
	D. B. Lovell	Worcester, Mass.
	George B. McAuliffe	New York, N. Y.
	Horace G. Miller	Providence, R. I.
	Thomas R. Pooley	New York, N. Y.
	B. Alex. Randall	Philadelphia, Pa.
	R. L. Randolph	Baltimore, Md.
	Richard A. Reeve	Toronto, Can.
	H. O. Reik	Baltimore, Md.
	Geo. L. Richards	Fall River, Mass.
	S. O. Richey	Washington, D. C.
	Wheelock Rider	Rochester, N. Y.
	Henry W. Ring	New Haven, Conn.
	Samuel D. Risley	Philadelphia, Pa.
	J. D. Rushmore	Brooklyn, N. Y.
	Frank B. Sprague	Providence, R. I.
	Geo. T. Stevens	New York, N. Y.
	S. B. St. John	Hartford, Conn.
	George T. Strawbridge	Philadelphia, Pa.
	T. Y. Sutphen	Newark, N. J.
	J. Oscroft Tansley	New York, N. Y.
	Lewis H. Taylor	Wilkesbarre, Pa.
	Samuel Theobald	Baltimore, Md.
	John Van Duyn	Syracuse, N. Y.
	D. Webster	New York, N. Y.
	Fred Whiting	New York, N. Y.
	W. H. Wilmer	Washington, D. C.
	F. M. Wilson	Bridgeport, Conn.
	Hiram Woods	Baltimore, Md.

Drs. Green, Miller and Risley were appointed as a Business Committee.

Drs. Gruening and Crockett were appointed as a Committee on Nominations.

The Treasurer's report was read by Dr. Jack, and Dr. Sutphen was appointed as auditor.

The following gentlemen were invited by the Society to participate in its deliberations: Dr. D. W. Allen, Pittsburg, Pa.; Dr. Spenser, St. Louis, Mo.; Dr. White, Richmond, Va.; Dr. C. F. Clark, Columbus, O.

The following papers were presented:

I. Dr. Herman Knapp, New York, N. Y. A Case of Mastoiditis with Features of Osteomyelitis; Extension to the Occipital Bone, disseminated abscesses in the Bones and under the Deep Muscles of the Neck. Two operations without encroaching on the Tympanic Structures. Complete Recovery. Hearing Unimpaired.

Discussed by Drs. Gruening, Dench, Bacon, Whiting, Crockett, Fiske, Bryant, Randall, Sprague and Knapp.

II. Dr. Charles W. Richardson, Washington, D. C. Report of Two Cases of Cerebral Abscess, with Recovery.

III. Dr. Emil Gruening, New York, N. Y.

1. A Case of the Right Cerebellar Hemisphere with Caries of the Left Mastoid Process.

2. Abscess of the Left Temporo-Sphenoidal Lobe. Operation. Recovery.

Discussed by Drs. Jack, Whiting, Bacon, Dench, Richards, Tansley, Randall and Gruening.

IV. Dr. Edward B. Dench, New York, N. Y. A Case of Acute Otitis Media and Sinus Thrombosis; Mastoidectomy; excision of Internal Jugular Vein; Serous Meningitis; Exploratory Craniotomy. Death, Autopsy.

V. Dr. Frederick Whiting, New York, N. Y. The Clinical Value of the Encephaloscope.

Discussed by Drs. Dench, McKernon, Sprague, Lewis, Whiting.

Membership Committee report and names of candidates approved.

Business Committee report by Dr. Green.

The following list of officers for the ensuing year was presented by the Business Committee and passed.

President	Dr. B. Alex. Randall.
Vice-President	Dr. William H. Carmalt.
Secretary and Treasurer . . .	Dr. Frederick L. Jack.
Committee on Membership . . .	Dr. Gorham Bacon, Dr. Samuel Theobald. Dr. J. S. Prout.
Committee on Publication . .	Dr. Clarence J. Blake, Dr. J. Orne Green. (The Secretary *ex-officio*.

The Secretary read a letter of resignation from Dr. Arthur Mathewson, of Brooklyn, N. Y., which was referred to the Membership Committee, who are to report at the next business session.

The Secretary read a resolution in regard to Federation of Societies.

Voted to refer to Business Committee.

Dr. Green made a motion that the Chair appoint a committee of three to consider time and place of meeting of the Society for next year, said committee to report in executive session next day.

The Chair appointed Drs. Theobald, Richey and Green.

Session adjourned.

Wednesday, May 13, 1903.

The reading of papers was resumed as follows:

VI. Dr. Thomas R. Pooley, New York, N.Y. A Case of Mastoiditis; Sinus Thrombosis; Pyaemia; Two Operations; Recovery.

VII. Dr. James F. McKernon, New York, N. Y. Thrombus of the Sigmoid Sinus. Report of Two Cases presenting some symptoms differing from those usually found in this disease.

VIII. Dr. L. O. Reik, Baltimore, Md. The Effects of Increased Intra-tympanic Pressure. A Possible Explanation of Tinnitus Aurium.

IX. Dr. Gorham Bacon, New York, N. Y. Report of a case of Double Acute Mastoiditis followed by Sinus Thrombosis and other Complications. Operation; Recovery.

Discussed by Drs. Randall, Jack, Woods, Sprague, and Crockett.

X. Dr. Frank Buller, Montreal, Canada. Chronic Suppurative Otitis Media, Thrombosis of the Sigmoid Sinus and Internal Jugular. Operation on Mastoid and Sinus with Ligation of the Deep Jugular, followed by Septic Pulmonary Complications, and death sixty-five days after operation.

Discussed by Drs. Sprague and Bacon.

XI. Dr. B. Alex. Randall, Philadelphia, Pa. A Study of the Surgical Relations of the Facial Canal.

Discussed by Drs. Bryant, and Sprague.

XII. Dr. George B. McAuliffe, New York, N.Y. A Few Suggestions in Aural Treatment.

Discussed by Drs. Crockett, Randall and McAuliffe.

XIII. Dr. W. S. Bryant, Boston, Mass. Report of a Case of Fibroma of the External Auditory Canal, with Serious Reflex Symptoms.

Discussed by Dr. Bacon.

XIV. Dr. Frank Buller, Montreal, Canada. A Practical Suggestion in regard to the Use of Politzer's Inflation.

Discussed by Drs. Randall, McAuliffe and Fiske.

XV. Dr. Frederick L. Jack, Boston, Mass. A Mastoid and Auricle Retractor.

The Business Committee have received an invitation issued to different societies to meet in joint session once in five years. The committee deemed it unwise to com-

plicate its life by further affiliations with other societies, and therefore reported itself adverse to joint sessions.

The Membership Committee asked instructions in regard to Dr. Carhart and Dr. Oatman. Names withdrawn.

The committee recommended that in case these two names were left out, to leave the following names until next year:

Drs. Shattuck, Haskin, Jordan, Renner, Pagne, McDonald and Duel.

The committee recommended that the following named gentlemen become Associate Members:

Drs. Harris, Phillips and Harlan.

Report accepted.

The Committee on time and place for next meeting recommended that further committee be appointed by the President to confer with the Ophthalmological Society to determine on time and place of next meeting, and further recommended that time and place of future meeting be considered by the Society, and that a copy of this report be forwarded to each member of the Society, in order that each member of the Society shall have a chance to express an opinion.

Committee on Membership reported favorably on resignation of Dr. Mathewson.

Motion made by Dr. Green that Secretary cast ballot that Dr. Mathewson be elected an honorary member.

Voted, and Secretary cast ballot.

The President reported the demise of Dr. Frank W. Abbott of Buffalo, and Dr. Oren D. Pomeroy of New York city.

Voted, that resolutions be prepared by Publication Committtee in regard to Dr. Pomeroy.

Adjourned.

FREDERICK L. JACK,
Secretary.

A CASE OF MASTOIDITIS WITH FEATURES OF OSTEOMYELITIS; EXTENSION TO THE OCCIPITAL BONE, DISSEMINATE ABSCESSES IN THE BONES AND UNDER THE DEEP MUSCLES OF THE NECK. TWO OPERATIONS WITHOUT ENCROACHING ON THE TYMPANIC STRUCTURES. COMPLETE RECOVERY; HEARING UNIMPAIRED.

By Herman Knapp, M. D., *New York N. Y.*

Clinical History. Mrs. Sam. Agid, a frail and pale woman, 34 years old, in the eighth month of pregnancy, consulted me Sept. 30th, 1902, for pain in the left mastoid region during the last three weeks, and then accompanied by headache, nausea, and insomnia. She had had no earache and no otorrhoea. Her hearing of the voice was v = 20/20—on both sides. Ear canal wide, mt. normal, Shrapnell red, somewhat bulging. The mastoid process was enlarged, dull red, hard; tender and doughy in the posterior part, the adjacent suboccipital region painful. She said that she had had fever at night, and at times also chills.

Oct. 1. *Operation.* Ether narcosis. Curved section through skin and periosteum from the mastoid tip to upper insertion of the pinna. The os planum, the antrum pit, the suprameatal spine were uncovered. The chisel readily opened the antrum, which contained pus and soft granulations. The latter were removed with a curette. Chiselling down through the mastoid uncovered a number of small

pus cavities which were connected with one another by threadlike passages. In the tip and posterior border the structure of the bone was less dense, more vascular, brittle, with here and there a necrosed loose particle. The tip was a decaying shell of which the lower and medial borders, being denser, were left. Posteriorly a horizontal incision of 3 cm was made. Decaying particles of bone surrounded by pus and granulations were abundant. When they were curetted away, a cavity was exposed at the bottom of which the sigmoid sinus lay bare 3 cm in length. Above and in front the healthy looking dura mater at the base of the middle cranial fossa was exposed. The walls of this large cavity were carefully cleansed with sharp spoons, and when no more passage ways, exuding pus, were discovered the wound cavity was bandaged with iodoform gauze and absorbent cotton. The dressing was left untouched for a week as there was no secretion and no unfavorable symptom. On the eleventh day when the tampon was removed, the wound was found in good condition. A lighter dressing of sterilized gauze was applied, to be changed daily. Up to the 19th day (*Oct. 18th*) the general condition was quite satisfactory. The temperature varied between 97.4° F to 100°. The operation and after-treatment had had no influence on the pregnancy. The patient left the hospital on the 18th day for out-door treatment.

She came again on *Oct. 23d*, feeling well, temperature normal, but the dressing was impregnated with purulent secretion. Pressure behind the head of the sterno-cleido-mastoid muscle, backward and downward along the lower part of the skull liberated a considerable quantity of greenish pus. The whole wound was carefully scraped and cleaned out with a sharp spoon, dusted with boric acid and iodoform powder, and plugged with sterilized gauze.

Oct. 25th. Pressure on the surroundings of the wound brought forward a good deal of pus from the inferior and

obliquely-down and backward direction. The suppuration had spread among the lateral muscles of the neck along the sterno-cleido-mastoid muscle, and among the deep muscles in the suboccipital area. On sounding, the probe penetrated only 2 or 2.5 cm down on the lateral part of the neck, but 5.2 cm between the deep muscles in the upper cervical space, near the median line, touching rough bone along the occiput.

Carious bone evidently being the cause of this extensive suppuration, a *second operation* was proposed to the patient.

She returned and was readmitted *Oct. 27th*, feeling weak, having a headache, and pain behind the ear. Pressure on the lower edge of the wound liberated a great quantity of greenish pus through the two fistulous openings mentioned before.

Second operation. Ether necrosis. After enlarging the wound downward the remnants of the mastoid left at the first operation were cleanly removed, the mastoid being now totally resected. The walls of the neighboring bones were smoothened with the electric burr.

Then a branch of a strong pair of scissors was introduced on a grooved director under the deep muscles in the upper cervical area, along the lower surface of the occipital bone. A moderate quantity of serous fluid gushed forward, followed by a copious flow of bright-red blood (presumably from the occipital artery) which by digital compression soon stopped. The probe discovered a rough and uneven surface of the occipital bone. The latter was exposed about 5 cm horizontally and 2.5 cm vertically, and as it proved soft and brittle a slice of the same size was removed, exposing a corresponding area of healthy-looking cerebellar dura mater.

The next day, *Oct. 28th*, she felt very weak and had high fever. (Pulse 120, temp. 102.8° F.)

Oct. 29th, feels better; wound clean, and free from swelling and odor; new dressing.

Nov. 3d. A good deal of pus has been pressed out every day, less today; no fever, no headache; patient feels well. Probe passed 4 cm into the abscess cavity back and downward under the deep muscles of the neck.

Nov. 6th. Cavity of fistulous opening enlarged, pus pressed out.

Nov. 9th. Cutting out a piece of partially loose bone, which barred the opening of the fistula leading into the abscess cavity. The wound had been tamponed with iodoform gauze. The opening was again enlarged with scissors and a perforated silver tube was inserted.

Nov. 11th. The cavity was emptied and the tube reinserted every day. Patient discharged.

Nov. 23d. The wound has become steadily smaller and the silver tube had to be changed for smaller ones. On pressure a small quantity of a sirupy liquid escaped. No rough bone could be felt, though the probe could still be passed 5 cm inward. No soreness. The wound was enlarged with scissors obliquely downward from the original opening. This liberated again a quantity of serous liquid retained in the abscess cavity, and its escape was followed as before by effusion of bright-red blood. The wound was plugged with aseptic gauze, but the bleeding was stopped only by compression lasting 15-18 minutes. A gauze pressure bandage was applied.

The symptoms now gradually disappeared, the wound was still dressed by the family physician, and the recovery was completed in December.

I wrote the patient to let me see her again. May 1st, 1903, she came, perfectly well. Her baby is healthy and vigorous. The operation left an irregular more elongated than deep clean scar, free from all annoyance. The tympanic membrane is pale and slightly sunken, the same

as that of the other ear; her hearing is the same in both ears, as it was before the disease, namely h=5/24″, v= 20/20′. Duration of the disease eight months. Two operations: total resection of the mastoid portion of the temporal, and removal of a carious piece of the occipital bone with free exposure of the cerebellar dura mater.

REMARKS.

Reviewing the case the following observations may be noteworthy.

1. *The infection travelled through the tympanic cavity without perforation of the drumhead*, manifesting its passage only by redness and some bulging of Shrapnell's membrane.

2. *The mastoid process was swollen, hard and only at the posterior and lower parts slightly doughy.* Its interior was congested, mostly solid (diploic, in transition to being compact) with numerous small collections of pus, and toward the lower and posterior surface crumbling bone tissue, bathed in pus, the foci communicating with one another through narrow passage-ways. This, with the almost normal tympanum, suggested at once the existence of mastoid osteomyelitis, which was to a certain degree upheld by the conditions found during the operation. Osteomyelitis does not occur in bones that have no marrow. In pneumatic and compact mastoids we find no bone-marrow, but it exists in the diploic varieties, where the small cavities are filled with marrow, and not with air. (See Zuckerkrandel, Blau's Encyclopaedie der Ohrenheilkunde, Leipzig, 1900.) The mastoid in our patient was diploic, and numerous small abscesses were scattered through its substance; furthermore, to strengthen the supposition, there was present a good deal of decaying and

necrosed bone substance. The inflammation was acute in an anaemic, weak and pregnant woman. The conditions of acute infection with ubiquitous staphylococcus pyogenes might easily have occurred. Yet the diagnosis cannot be more than a supposition which may be correct. The patient's first complaint was pain in the left mastoid region, which in three weeks was followed by headache, nausea and insomnia. The examination with the mirror showed a wide ear-canal, a normal drumhead, but Shrapnell's membrane was red and bulging. This is evidence that the epi-tympanic recess was inflamed. Cases like this, where the membrana tympani shows no, or only a trifling, inflammation and where all the symptoms point to the mastoid, have been described as primary mastoiditis, but such cases are the rarer, the more accurately we examine, and it is now generally believed that they begin in the usual way, but the infection travels through the tympanic cavity with no perceptible symptoms, whereas its action manifests itself conspicuously in the mastoid.

Cases as the one I have just detailed, are not so rare. Several marked ones of my own practice are vividly before my mind. Their salient feature is the existence of disseminate small abscesses connected with one another by narrow passages in mastoids of diploic structure on the way to become compact. One of them, a gentleman of about 40 years, had a history in symptoms, course, treatment (three operations), pathological conditions and perfect recovery (now over more than ten years without a relapse), so similar to our present patient that his case was a facsimile of the other's.

With regard to the treatment of these cases the present one emphasizes the advice urged by many an aurist, to remove the whole mastoid, especially the entire tip. Yet nobody would advise this as a standing rule in all mastoidectomies. This would lead to obnoxious exaggeration.

In acute mastoiditis, for instance, there will be a fruitful field for the simple antrectomy. In cases, however, may they be acute, subacute, or chronic, where the opening gives the picture of diploic bone with disseminate purulent foci, we should not, as I did in this and have done in other cases, stop when, even with the minutest search, we could not find any more trace of disease in the bony walls of our operative cavity, but we should make a resection of the whole mastoid apophysis, and moreover inspect carefully the outer wall of the sigmoid sulcus and the adjacent portion of the occipital bone.

Regarding the treatment of the fistulas and abscesses in the suboccipital cervical region I have seen recoveries by splitting extensively the thick muscular layer, leaving ugly scars, further by draining the abscess with a counter opening, and, as in our case, by keeping the mouths of the abscess cavities wide open and have care to remove the pus by tamponing and pressure. Punctilious care will bring this about, but, as in other bone fistulas, no sooner than the last necrosed piece of bone is removed, either by self-elimination or resection.

DISCUSSION.

Dr. Gruening :—I think the tip of the mastoid is the very portion of the mastoid that ought to be attacked, and ought to be attacked first, and I do it. I do not open the antrum first. I open the tip, and very frequently I find the pathological process going on in the tip when there is no longer anything in the antrum. I do not know how we can tell when we open the antrum that there is no disease in the cells, and it seems to me that it is necessary to remove the whole cortex in every case of mastoid disease.

Dr. Dench :—I quite agree with what Dr. Gruening has said about the propriety of removing the mastoid process

in every case of mastoiditis operated upon. I do not, however, agree with his statement, that there are many cases where the abscess is limited to the tip of the mastoid, without involvement of the antrum. It seems to me that in those cases where the disease is apparently confined to the apex of the process, and where the antrum is seemingly not involved, it is always well to open the antrum as well as the tip, and to obliterate all the pneumatic spaces in the mastoid. I think it is equally reprehensible to confine the operative interference to the antrum, and to fail to remove the mastoid tip, even where the disease, at the time of the operation, is apparently limited to the antrum and upper mastoid cells. I have operated upon several hundred of these cases during the past few years, and I have never found a case of acute mastoiditis in which it was not necessary to take away the cells at the tip. On opening the mastoid I have quite frequently found a condition where the disease seemed to be limited in extent; on breaking down, however, what seemed to be a partition of healthy bone, I have found a purulent deposit beyond this partition in the direction of the mastoid tip. It seems to me, therefore, that the only thing to do in every case, where pus is found in the mastoid at the time of operation, is to obliterate the entire pneumatic structure. This applies not only to those cases in which pus is found in the antrum at the time of the operation, but also to those cases where at the time of operation the purulent focus is apparently limited to the cells at the mastoid tip. The entire pneumatic structure of the mastoid must be obliterated in each instance.

Dr. Gruening:—When I said in my remarks a little while ago that I began at the tip, I meant to have stated that I worked up from the tip to the antrum. That is certainly the more correct procedure. When you begin below you expose the sinus before you get to the antrum, and to reach the antrum under the sinus is very difficult,

while if you begin below you will reach the antrum with greater facility.

Dr. Bacon :—We all see cases in which we find tenderness over the antrum when there is none over the tip, and when we come to expose the bone we find the tip almost entirely gone, so it seems to me it is always wise to expose the tip, especially when we find the disease is due to a virulent infection.

Dr. Whiting :—I think the cases described by Dr. Knapp are not by any means rare. I have certainly seen many of them. It is rather difficult to make a differentiation between diploic mastoid and pneumatic mastoid at time of operation. I think the experience of finding pus in the antrum, then an area of apparently healthy bone all around, or which appears to be healthy, and beyond this area of bone, a focus of pus, is a very common experience, and that this focus of pus should extend back into the occipital region is not at all unusual.

It is a very arbitrary division when you say that certain cells are diploic bone, and others pneumatic tissue. It seems to me that the only safe plan is to follow the advice of Dr. Gruening, and remove the structure. We have noticed particularly in children how frequently perforation of the cortex occurs at the root of the zygoma. These cells are very closely associated with the tympanum, and I think it very important to investigate them. When we find a partition of healthy bone, it ought by no means keep us from investigating the cells of the tip.

Dr. Crockett :—I do not understand what we mean by removing the tip. It seems to me that such an extensive operation as that is unnecessary, and if we remove the outer cortex thoroughly without removing the tip itself the same results will be accomplished without causing the deformity. I agree with Dr. Gruening. The procedure has always seemed the most practical one to me. By

doing it we remove the infection without injuring the patient, whereas in opening the antrum with the tip still full of pus the antrum is endangered and pyaemia is very likely to result, but the tip itself, it seems to me, should not be removed in the great majority of cases.

Dr. Fiske:—I agree with what has been said about opening the antrum first. It seems to me also, as has been said, that a certain portion of the hard bone of the tip ought to be left. This case of Dr. Knapp's reminds me of a case I saw last winter of a man having osteomyelitis. He had quite a portion of the occipital bone removed. We had to go back to the first cervical vertebra.

Another case I saw in Germany in 1883. Operated on three or four times, three times while I was there. The child eventually died, so they do not always turn out well.

Dr. Bryant:—Dr. Knapp's paper shows some interesting facts, and it is a very instructive paper. One feature in particular, that is, the probability of pneumatic cells in the occipital bone. This is not at all uncommon.

Dr. Randall:—In regard to the point brought up by Dr. Bryant, I also have found pneumatic cells in the occipital bone, as figured in Randall & Morse, "Photog. Illustrations," '87. In the examination of six hundred temporal bones I have found very few that did not show preponderatingly pneumatic structure, yet there were quite a number with small portions that were diploic in their nature. In cases like Dr. Knapp's, of which there are quite a few, the question has been brought up whether or not we should make counter-openings. It seems to be that a good wide opening, following the surgical rule, that the wound should be *as broad as it is deep*, would meet all requirements.

Dr. Knapp:—This discussion has brought out greatly divergent views. I think we are all united in the belief, that the handling of mastoiditis in general requires a great

deal of *attention*, *judgment* and *experience*. Attention and judgment are mental qualities, experience is not an endowment, but a property acquired by education. To study mastoiditis, we must not begin with the operations done on the mastoid, but with the close observation of the natural history of mastoiditis, its etiology, course, and termination. Now there are plenty of cases of purulent tympano-mastoiditis that get well without any medication whatever, simply by rest, care and time. This proves that all cases of tympano-mastoiditis do not require operation. Further, there are many cases of otitis media purulenta, with otorrhoea and mastoid involvement: tenderness by pressure on the antrum region, the tip and the posterior border, that recover without operation. Others show spontaneous perforations of the mastoid, with sinus and cerebral involvement, which recover, even from metastatic pneumonia. Knowing all that, we must still learn what per centage of each group recover spontaneously, and with what permanent damage. Here our experience as to the indications in a given case has to be supplemented by attention and judgment. In regard to the mode and extent of the mastoid operation, I think it is safest to follow the course of nature: first examine and treat the rhinopharyngitis, (prophylaxis, rest), then the tymyanic cavity (rest, paracentesis), then simple chiselling of the antrum region, which I still consider a legitimate operation in many acute cases; then the removal of the outer cortex of the mastoid and see how much of the interior is diseased (partial or total resection), then the cerebral and vascular involvements, etc. I think all these conditions have their indications; doing too little is dangerous, or doing too much may be fatal. In mastoiditis we should always be aware of the responsibility in the case, examine carefully, judge without preconceived opinions, and when we have reached a definite conclusion on the gravity o the case, letour action be equal to our convictions.

Dr. Jack:—My experience with the use of gauze in a few cases where the opening into a brain abscess was through the tegmen tympani has been unfavorable. I found the gauze acted as a plug and prevented free drainage, and bad symptoms returned. I have discontinued using it in this class of cases and have found rubber tubing or turkey bone more satisfactory.

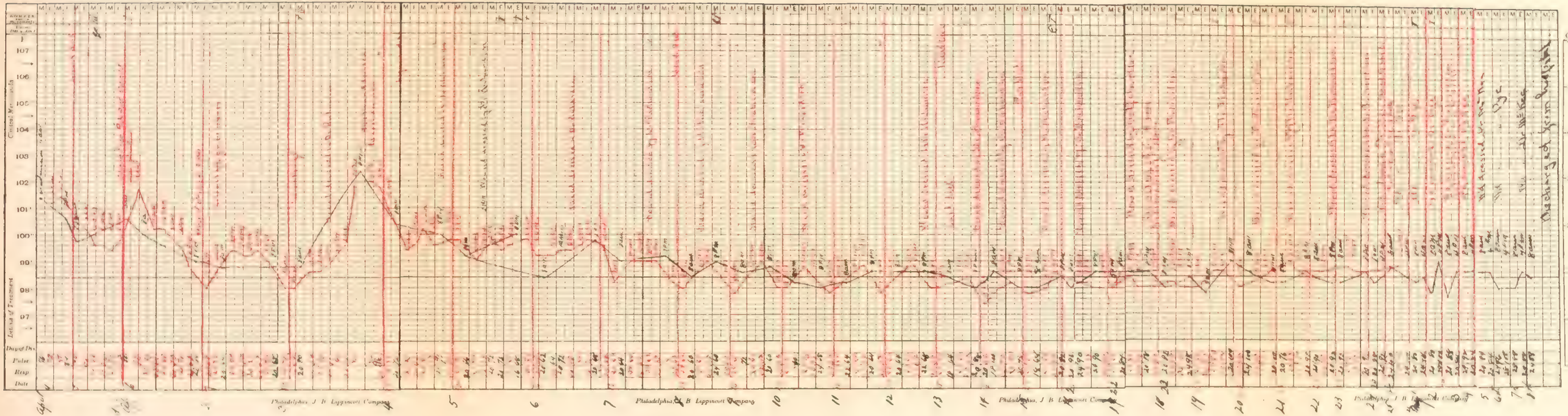
REPORT OF TWO CASES OF CEREBRAL ABSCESS, WITH RECOVERY.

By Charles W. Richardson, M. D., *Washington, D. C.*

At the meeting of the American Medical Association, held in Atlantic City, and before this Society, I have had the pleasure of a reporting a case of cerebral abscess of otitic origin, which unfortunately proved fatal; therefore, greater is my pleasure in bringing to you today the report of two favorable issues in cerebral abscess, both of which were operated upon during the past four months.

Case I. On March 13, 1902, there came under my professional care a young man, well nourished, in good general health, but of nervous temperament, twenty-eight years of age. In early childhood, he had scarlet fever, which caused an otitis media suppurativa in right ear. The suppuration had been continuous. He had been under the observation of several skilled otologists, all of whom had given him the same advice. In Chicago, he had polypi removed from the ear. When he came under my observation, I found the right ear producing quite a free, watery, offensive, irritating pus. There was a chronic dermatitis of the external canal. Tympanic membrane completely destroyed; head of malleus and body of incus present; anterior portion of tympanic cavity epidermatized, while posterior and upper posterior quadrant were quite congested. A probe being passed upward and backward readily detected necrosed bone. Course of discharge could be readily traced as coming from region of the auditus. The patient was advised to submit to the radical

operation. He stated that such advice had been constantly given him, but that he preferred to try less active methods under my care. Such a course was adopted. In November, 1902, he decided, without urging on my part, to consent to the radical operation. At this time, I noted a slight change from his usual vivacious temperament — which I did not connect with the subsequent events — and concluded that it was due to the thoughts of the operative procedure. On November 24th, the radical masto-tympanic exenteration was done. The only points worthy of note in the operation were that the antrum was large, contained pus, and was lined with a villious like lining membrane. The auditus and part of the mastoid antral wall were necrotic. While chiselling away the anterior tympanic wall, the tegmun, which was necrotic, fell in, leaving a small area of dura exposed. The operation was completed with the usual care, and the patient made the usual good recovery. At the end of ten days, he was discharged from the hospital, with external wound primarily united, and the tympano-mastoid surface in fine shape. The usual cheerful demeanor of patient returned after the operation. On December 7, while at my office, I noticed that the patient was taciturn, and had a more anxious expression than usual. On the 8th, his mother became exercised by this change of demeanor. On the 9th, this condition was more marked. Patient's temperature was 99.2°, pulse 76, respiration normal, and he complained of pain about the region of the wound. On the 10th, the patient's condition was somewhat improved— temperature normal. About five o'clock of this day, the patient's mother called me up over the telephone and stated that her son had slept quite heavily since lunch time, and was then asleep. Later in the evening, I called at the house of the patient, and found that he was up and about, evidently making some effort to keep wakeful, and



in good spirits. During the morning of the 11th, had first evidences of cerebral pain. Had passed a restless night, with considerable pain. When I called at noon, was told that he had been drowsy all morning, and, when awake, indifferent to what was going on about him. Pulse was 80; temperature 99.2°. Considerable pain the same evening over the forehead, or right side. Patient had considerable pain the morning of December 12. Somewhat more drowsy, although cerebration still perfect, when attention was aroused. Tenderness on tapping over parietal region. Temperature normal, pulse 70. Examination of eye showed no alteration. Consultation requested and all arrangements made for immediate operation. Dr. W. P. Carr saw patient with me at 1 o'clock, and, while agreeing as to the nature of the case, advised delay until more positive localizing symptoms developed. Shortly after 4 P. M., the nurse called my attention to the fact that the patient's pulse had dropped to 60, with a temperature of 99.8°. At the time of his removal to the hospital, his cerebration was almost perfect, when aroused, although showing signs of sluggishness and indifference—very drowsy. I caused the patient to be removed to the hospital as speedily as possible, and at nine o'clock the same evening the operation was done. The posterior wound was opened along its line of union, granulations were cleaned out, and additional dura exposed around the seat of the dura exposed in the original operation. Enough bone was removed to expose the dura for an area of nearly two centimeters square. The dura presented no bulging, felt soft, and readily yielded to pressure and did not pulsate. The dura was incised and a grooved director was passed slightly forward and upward into the cerebral substance for about a centimeter, when there was a gush of at least 32 c. c. of ill-smelling pus. The cerebral wound was dressed as usual, and the

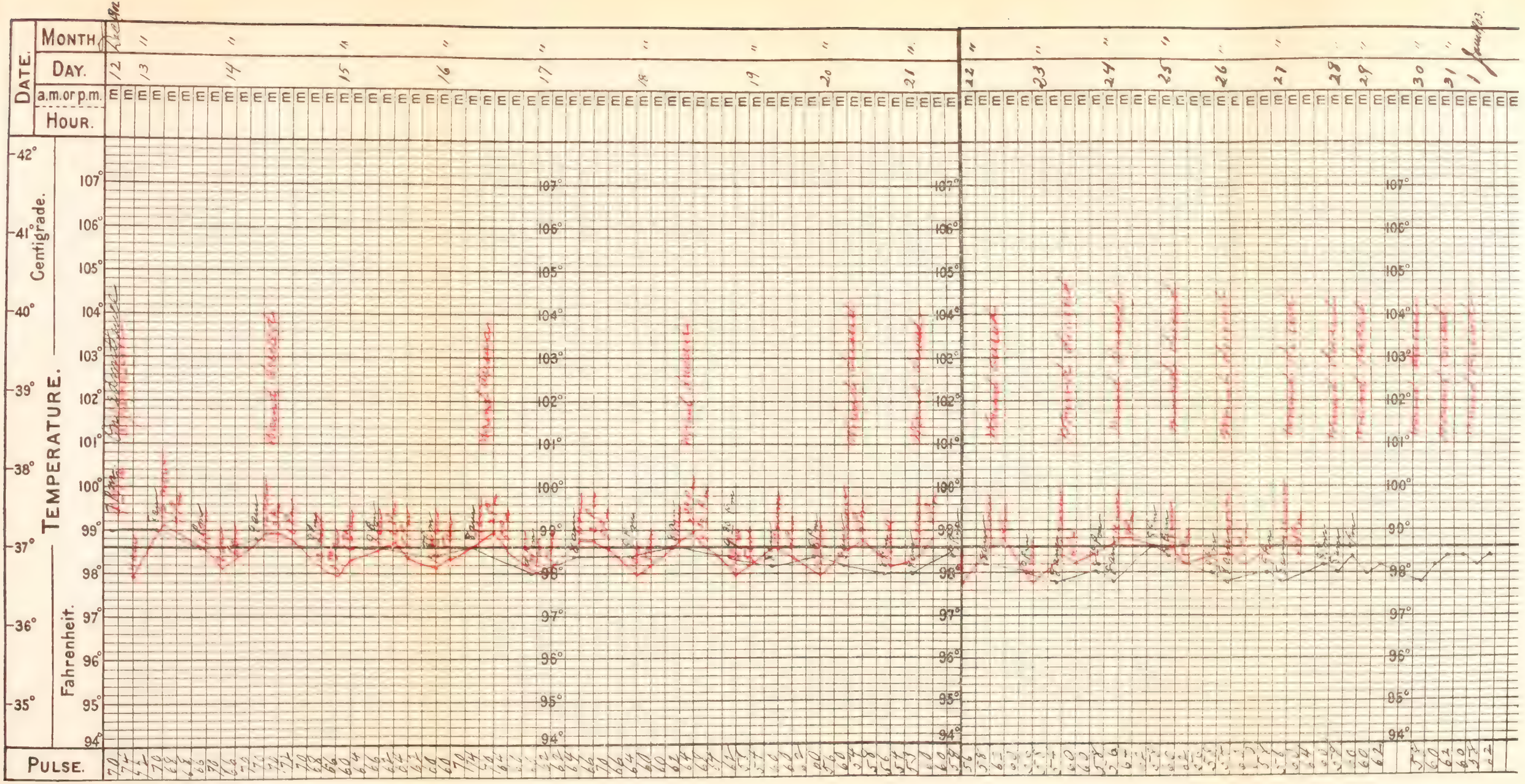
patient put to bed. Patient was apparently normal in every respect when seen the following morning. Wound dressed on the 14th, and everything found perfectly clean. No pus. Dressed again on 16th, when condition was found the same as on the 14th. On the 18th, the dural wound was allowed to close. Patient made an uneventful and perfect recovery.

Case II. On February 16th, in my office work, there came under my observation a boy of thirteen years of age, with a chronic suppurative otitis on the right side. His mother told me that the child had had an acute suppurative otitis two years before, without any painful symptoms. The ear had been suppurating ever since, improving at times—the discharge never entirely ceasing. From time to time, he would have some little pain in the ear, which was usually followed by increase in discharge. During the six months previous to bringing him to me, the child had had frequent headaches, was irritable, peevish, and ofttimes disinclined to take nourishment. The child was of normal height, but poorly nourished, and very pale. His temperament was nervous. Excessively anxious as to the character of treatment, and constantly fearful of pain. Mastoid region normal in appearance, and not tender to touch on firm pressure. Examination of ear. The auditory canal was normal. Greater portion of membrane destroyed. Tympanic cavity filled out with granulation tissue. Malleus and incus present, both seemingly carious. The clearing out of the tympanic cavity was somewhat tedious on account of the excitable state of patient when attempting to do anything in operative line. About March 1, had cavity clean, and found malleus and incus free from caries. Patient now disappeared from attention for some days. Returned March 24th, when his appearance caused me to be concerned about his condi-

tion. Had considerable frontal pain. Temperature 100°; pulse 90. Child's mother came with him on 26th, at my suggestion, and I found his condition quite as unsatisfactory. I told his parent of the inadvisability of his being allowed to go about, and suggested that he be placed in the hospital for closer and more accurate observation. At mention of the word hospital, the child collapsed.

On March 29, the child was placed in the Episcopal Eye, Ear and Throat Hospital. At the time of his entrance, his temperature was 101°, with pulse of 74. There was considerable head pain in the frontal region, and the child was very much distressed about his position, and evidenced an intense yearning to go home. Appetite completely gone. The temperature gradually fell from March 29 to April 1, and became pratically normal. During this time, the head pain ceased, and the child's general condition improved, his irritability almost disappeared, and his appetite improved. At the earnest solicitation of the child and mother, on April 1, he was allowed to go home. A couple of days afterwards the parent returned and told me that the child's head pain had returned as severe as ever, and that there was even more irritability then had previovsly existed, and, with the loss of appetite, there had been more or less vomiting. I suggested that the child should be reintroduced into the hospital, and several days afterwards he was again taken back. My diagnosis had been about fully made up, and, on April 5, the child's head pain becoming so severe—although the vomiting had ceased and the nervous irritability was so intense, with slight drowsiness and decrease in the pulse rating, falling to 60—I decided to operate. On Sunday evening at 8 o'clock, the preparations were made to operate on the child for the purpose of evacuating pus, which was supposed to be contained in the cranial cavity. There were no evident symptoms of mastoiditis. The

operation which was done was a Schwartze radical operation. On entering the antrum, pus was found therein, but the cells surrounding were all apparently normal. The communication was established between the mastoid antrum and the tympanic cavity. The outer plate was then taken away, and the dura exposed over the antrum mastoideum, and running forward toward the tegmun. When the tegmun was taken away, there was an evacuation of about a drachm of pus from a subdura abscess. The dura was slightly thickened, there was no pulsation, with moderate bulging. An incision was made into the dura, and one or two probings were carried slightly forward and upward without the evacuation of pus. On cutting almost directly inward and upward, there was an evacuation of considerable pus, the purulent cavity being about a centimetre within the cerebral substance. The large cavity thus opened up, was dressed in the ordinary way, and the wound was closed. The improvement was continuous. On the 31st, the dressings were changed, and, on the 4th, on account of the rise in temperature, they were again changed, and, on passing the director inward, there was an evacuation of about two drachms more of pus. This caused a rapid fall of temperature. Two days later in the dressing, on carrying the director directly forward and upward, another pus cavity was opened up. This was attended with liberation of nearly as much pus as followed the first opening. At each subsequent dressing, there was a liberation of a diminished quantity of pus. One interesting feature in the case was that, after the evacuation of the second abscess, there was always more or less apparently ventricular fluid flowing before the starting of the pus. The amount of ventricular fluid increased in quantity at each dressing, while the amount of pus gradually diminished until, in about two weeks, the pus had entirely ceased to flow, the fluid being clear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ventricular. The dura was allowed to close. Three days afterwards the boy developed a pain on the left side, just opposite to the side of the operation and which pain he described as the same, and nearly as intense as the pain on the right side. I then again opened up the dura, and passing the director in nearly five centimetres, there was a flow of a couple of drachms of ventricular fluid. This was attended with a complete abatement of the pain on the left side. The dura was then allowed to close again, since which time the boy has made a continuous, uninterrupted recovery.

The first case, of course, has nothing of peculiar interest, it being simply a temporo-sphenoidal abscess, attended with the usual characteristic symptoms and terminating with an unusually favorable course. The second case presents two interesting features: First. The fact that the child went on for a period of five or six months with cerebral abscess, without any very marked symptoms, except those which the parents had described to me as the usual characteristic and ordinary temperament of the child; in fact, the nervousness and irritability, and the head pain they had connected, for some time, with the natural temperament of the child, and looked upon them as natural characteristics, and as being none other than his normal condition.

When they had brought him to my observation, they rather impressed me with the idea that he was an extremely irritable child, given to peevishness, suffering with headaches, and that his present condition was the ordinary. It was only through my careful observation of the case and watching the child that I recognized the fact that their views of the situation were incorrect. Since the child has recovered, and from repeated questioning, I found that the irritability of temperament only dated back six or eight months, which is evidently the period at which

the cerebral abscess had formed. I simply mention this as it shows that parents, however anxious they may be about children, will often mislead the physician to the detriment of the patient.

The second interesting feature is the evacuation of the ventricular fluid from the second abscess cavity, which evidently indicated that there was a communication with the lateral ventricle, the serous fluid evidently coming from this.

In cerebral abcesses of the right side, of otitic origin, we do not have that ease of diagnosis which we have when the condition is on the left side. Of course, with a suppurative ear on the left side, and the development of aphasia, without any other symptoms, one would naturally suppose the existence of a cerebral abscess. On the right side aphasia does not form a guiding line, but there are other points about the diagnosis of the cerebral abscess which are almost characteristic, and they usually come on early in the history of the case. One is the change in the demeanor of the patient. These I have seen in all my cerebral abscesses, and coming on at a very early period. Another is the characteristic frontal pain, which seems to be almost always present in these temporo-sphenoidal abscesses.

I include temperature charts of both of these cases, which can be studied with considerable interest.

A CASE OF ABSCESS OF THE RIGHT CEREBELLAR HEMISPHERE WITH CARIES OF THE LEFT MASTOID PROCESS.

By E. Gruening, M. D., *New York, N. Y.*

The case here described illustrates a difficulty encountered in the localization of an otitic brain abscess. Retardation, of the pulse rate, drowsiness, vomiting and rapidly developed optic neuritis were the symptoms pointing to the presence of cerebral abscess. As both ears were affected, the question arose as to whether the abscess was situated in the right or left side of the brain. At the time of admission the right ear was in a state of acute inflammation, which rapidly subsided after paracentesis of the drum. The left ear was more seriously affected. The mastoid cells were filled with pus and broken down bone tissue, and one of the ossicles, the incus, was carious. For this reason the left temporo-sphenoidal lobe and the left cerebellar hemisphere were exposed and freely aspirated. The result of the operative exploration was negative. At the post mortem examination a large abscess was found in the right cerebellar hemisphere.

B. S., a schoolgirl, ten years of age, was admitted to the Mount Sinai Hospital on April 3, 1903.

Past History.—In early infancy had measles, scarlet fever and diphtheria, but no ear complications after these diseases.

Present illness.—Acute onset ten days ago with pain on left side of the head, which still persists. Five days ago had chills and fever, severe headache and purulent dis-

charge from left ear. Child has been drowsy since onset and has been vomiting nourishment for the past three days.

Left ear.—Drum head red and swolen. Small perforation in lower anterior quadrant. No discharge. Over the region of the mastoid the skin is red and swolen and pits on pressure. No fluctuation. Tenderness over tip, antrum and behind the mastoid.

Right ear.—Drum is red and swolen. No perforation.

Mastoid.—Slight tenderness over tip and antrum.

General condition fair. Well nourished. Answers questions readily, but relapses into drowsiness when not spoken to. Tongue dry, heavily coated. Pupils of equal size, react well.

Ophthalmoscopic examination negative.

Lungs, heart, liver, spleen, abdomen negative.

Temperature 102.8°. Pulse 108. Respiration 28.

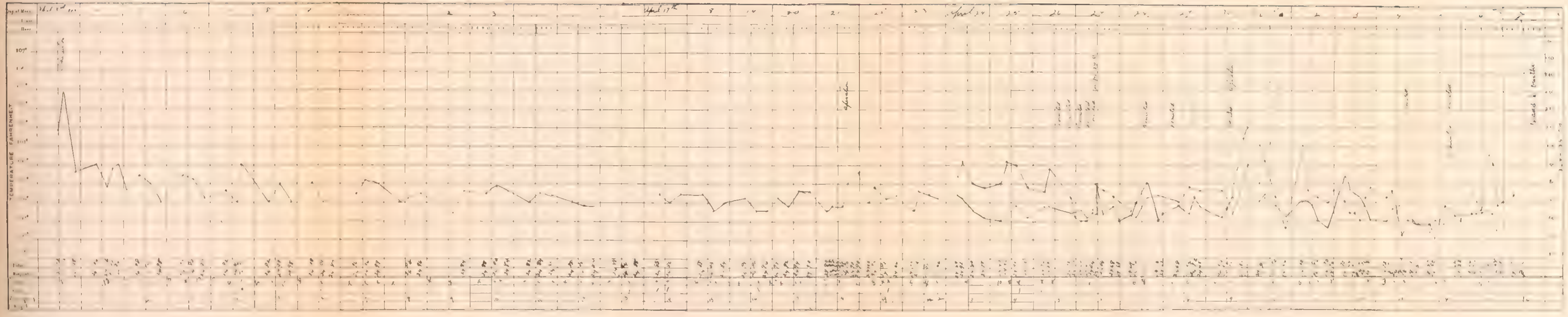
Several hours after admission, temperature 104.8°.

Operation—Osteotomy for mastoiditis (left.) Nitrous oxide and ether anaesthesia. Bilateral paracentesis of drum. Usual curvilinear incision over mastoid. Periosteum easily lifted. Cortex hard. Mastoid cells and antrum contain granulation tissue and pus. Thorough curettage. Sigmoid sinus exposed. It appears normal. Thorough irrigation. Dry iodoform packing. Dry dressing.

Time 45 minutes.

April 4. Patient much improved. Temperature 101°. Pulse 104. Respiration 24. Profuse sero-purulent discharge from right ear.

April 5. General condition good. Drowsiness has disappeared. Temperature 100.4°. Pulse 98. Respiration 24. Diminished mastoid tenderness on right side. Discharge from right ear still profuse.


TEMPERATURE FAHRENHEIT

April 7. Wet dressing to mastoid wound. Temperature 99. Slight discharge from right ear. No mastoid tenderness.

April 10. No discharge from right ear. Mastoid wound granulating. Out of bed.

April 16. Temperature 99.4°. Pulse 88. Respiration 24. Wound healthy. Dry dressing.

April 20. Patient vomited. Temperature normal. Right ear does not discharge. No tenderness of right mastoid.

Ophthalmoscopic examination negative.

April 21. Vomited repeatedly. Right pupil larger than left. Ophthalmoscopic examination negative. Temperature normal.

Operation. Cleaning out of left middle ear. Exposure of dura. Multiple exploratory puncture of brain with aspiration.

Nitrous oxide and ether narcosis. Incision extended upward and forward. Superior and posterior walls of external auditory canal, the drumhead, the ossicles, the antral and tympanic roofs, the temporal ridge and a part of the squama were removed. Incus carious. The malleus sound. The dura was normal in appearance. Intracranial pressure not markedly increased. The aspirating needle was introduced into the temporo-sphenoidal lobe in all possible directions. No pus was found,

Wound irrigated with alcohol and dressed dry.

April 22. General condition improved. No headache. Pupils equal. Temperature normal. No headache.

April 25. Temperature normal. Appetite good. Slight drowsiness.

April 26. Temperature normal. Wound covered with healthy granulations. Vomited at 4 in the afternoon and again at 8. Pulse retarded, 60–68. No headache. No aphasia.

April 27. Temperature normal. Pulse 64. No headache. Slight drowsiness. Ophthalmoscopic examination negative.

April 28. Pulse 66. Frontal headache. Drowsiness.

April 29. Continues to be drowsy. Vomited more. Pulse 60–70. Refuses food. Right pupil larger than left. No aphasia. No pupillitis.

April 30. *Operation.*—Exploratory puncture of left temporo-sphenoidal lobe and left cerebellar hemisphere. Anaesthesia by nitrous oxide and ether. Wound curretted and flushed with alcohol. Upper knee of sigmoid sinus and lateral sinus laid bare. Removal of part of the parietal bone above the knee of the sigmoid sinus and part of the occipital bone below the lateral sinus thus exposing a larger area of the temporo-sphenoidal lobe and of the cerebellar hemisphere. Numerous punctures and aspirations in all directions in temporo-sphenoidal lobe and cerebellum. Result negative.

May 1. No change in general condition. Remains drowsy. Pulse faster and irregular. Receives nutrient enomata.

May 2. No change.

May 3. Does not retain nutrient enema. General condition not changed.

May 4. Drowsy. Answers when aroused. Says she has no pain. Vomited.

May 5. More drowsy. Involuntary urination. Pupils equal and dilated. Ophthalmoscopic examination negative. General tonic convulsion lasting three minutes. Pupils widely dilated. Vomited after convulsion. Temperature 98.6°. Pulse 50–60. Respiration 16–18.

May 6. Child still can be roused but with great difficulty. Double optic neuritis present. Examination of right ear. Perforation healed. Temperature 97.4°. Pulse imperceptible. Respiration 8.

May 7. Tonic convulsion following enema. After convulsion respiration very slow, three per minute. Pulse can be felt. Artificial respiration kept up two hours.

Operation without anaesthesia. Multiple aspirations of left temporo-sphenoidal lobe and left cerebellar hemisphere, with negative result. Artificial respiration kept up during operation. Child died at 5.35 P. M. Wound inspection and partial autopsy allowed.

Report of the Pathologist.—Left mastoid region, site of recent operation, found clean. Granulations beginning to form. Dura mater, as far as could be seen, appeared normal. Cerebrum normal on surface and in sections. Recent aspirations in all directions negative.

Cerebellum, external inspection, negative on palpation; no softened spot or bulging. Vermiform process negative.

On section, left hemisphere shows sites of recent aspirations. No hemorrhage or abscess. Right hemisphere near upper surface of lobus clivi and extending forward and backward an abscess cavity the size of a walnut filled with greyish red pus. No odor. Surrounded by a pyogenic membrane of the same color. The external layers of the membrane were fibrinous in character. The surrounding brain tissue is negative in appearance. Culture from abscess. Streptococcus.

In the hardened specimen the abscess cavity measured 3 cm. in the antero-posterior, and 18 mm. in the transverse diameter. The limiting membrane has a thickness of 2.5 mm.

ABSCESS OF THE LEFT TEMPORO-SPHENOIDAL LOBE. OPERATION. RECOVERY.

By E. Gruening, M. D., *New York, N. Y.*

The symptoms which led to the diagnosis of abscess of the temporo-sphenoidal lobe in the patient under consideration were rapid development of choked disc, slow pulse rate, intense headache, and vomiting. The important localizing symptoms of abscess of the left temporo-sphenoidal lobe, amnestic aphasia, was absent before the operation, but appeared immediately after it. Other interesting features of the case were: (1) The discharge of pus from the abscess cavity followed by the flow of a clear watery fluid, evidently ventricular; (2) the rapid recovery of the patient in spite of the communication of the abscess cavity with the ventricles of the brain.

J. K., aged 17, an Austrian by birth and a furrier by trade, was admitted to the Mt. Sinai Hospital, April 15, 1903. He complained of pain behind the left ear. During the past three days he has had several chills. Both ears have been discharging a long time; he did not know how long, and the left ear always more than the right. On admission he suffered from frontal headache and photophobia. The left mastoid region was tender upon deep pressure, and the corresponding middle ear was filled with granulations and cholesteatomatous masses. The attic of the right ear was also diseased. Temperature 104°. Pulse 92. Respiration 28. Lungs, heart, liver, spleen, abdomen negative.

The pupils were small and equal and reacted well.

Opthalmoscopically the optic discs appeared somewhat swollen, redder than usual and the retinal veins dilated and tortuous.

Operation. April 15. Nitrous oxide and ether anaesthesia. Usual incision for the radical operation with an additional cut 3 cm. in length at right angles posteriorly. Entire mastoid exposed. Cortex hard and apparently healthy. Interior of mastoid down to the apex diploic in structure and softened. The supero-posterior wall of the external auditory canal had disappeared ; the radical operation had been performed by nature. The tympanic cavity was filled with granulations, the antrum packed with cholesteatomatous material. The sigmoid sinus was far forward, only 4 mm. from the external auditory canal and surrounded by diploic cells. The emissary vein was likewise imbedded in softened diploic bone structure. The sigmoid sinus and the emissary vein were laid bare. The upper knee of the sinus was covered with a thin grayish exudate, while its upper parts and the emissary vein presented the normal blue appearance. The cholesteatomatous masses were removed from the antrum and the granulations from the tympanic cavity. No ossicles and no tympanic membrane were found. The antrum, very large, size of a filbert, showed a perforation through its roof. The opening measured 1 cm. in diameter. The dura mater prolapsed into the antrum and was covered with hard granulation tissue. In the tympanic roof a small spot of discoloration was seen. The opening in the antral roof was enlarged by the removal of bone including the discolored area in the tympanic roof. In the dura mater no other changes save those mentioned above were found, and no pus was encountered in the cranial cavity. A small erosion was discovered in the bone over the horizontal semicircular canal.

At the termination of the operation which lasted over one hour, the wound was irrigated with sterile saline solution, flushed with absolute alcohol and dressed with iodoform gauze.

April 16. Temperature still 102°. Pulse slow, 70–80.

April 17. Temperature 101°. Pulse 60–70.

April 18. Temperature 101°. Pulse 80. General condition much improved.

April 20. Temperature 98.6°. General condition good. Soft diet.

April 22. Vomited this morning. Severe frontal headache. Photophobia. Optic discs red and swollen. Wound looks well. Temperature 99° to 100.4°. Pulse varying greatly in frequency—48 to 84.

April 24. Still complains of headache, but takes nourishment. No focal symptoms, no amnestic aphasia. Temperature 98.8° to 100.4°. Pulse 54 to 76. No vomiting. Late in the evening of the 24th began to moan and said that his headache was unbearable. Ophthalmoscopic examination showed marked double optic neuritis (choked disc). Sensorium clear.

Operation. April 25. Nitrous oxide and ether anaesthesia. Wound curretted, irrigated and treated with absolute alcohol. Incision 1½ inches long upward, exposing squama. Temporal ridge and portion of squama, tympanic and antral roofs completely removed. The exposed dura was thoroughly cleansed with absolute alcohol. Aspiration through under surface of brain in the region of the tympanic roof. The needle was carried one inch upward and one syringeful of thick pus was obtained. Crucial incision through dura mater and under surface of brain. Evacuation of about two ounces of thick yellow pus. Finger introduced into brain; limiting membrane felt.

No irrigation of brain abscess. Drainage by narrow selvaged strips of iodoform gauze. Wet dressing.

During the operation the pulse rose from 64 to 100.

April 26. Marked amnestic aphasia which did not exist before the operation. The patient could not name objects shown to him, but described their use in fluent language. Temperature 101.2°. Pulse 60. Slight headache. Pupils equal. No tâches. No rigidity of neck. Reflexes normal.

At the dressing of the wound the withdrawal of the gauze was followed first by a discharge of pus and then by a flow of a considerable quantity of clear watery fluid. After the dressing the pulse rose from 60 to 83. The symptom of aphasia was less apparent, the patient naming several objects, but tiring after a few questions. Choked disc still pronounced on both sides.

April 27. Temperature 99.4.° Pulse 86. General condition improved. Aphasia less marked; patient could name several objects. At the dressing pus and watery fluid evacuated from brain abscess.

April 28. Temperature 99.2°. Pulse 96. Patient felt well. Ate with good appetite. No aphasia. No retention. Left pupil larger than right. Choked disc still present.

The patient made a rapid recovery and was present at the May meeting of the New York Otological Society.

DISCUSSION.

Dr. Whiting :—I was very much interested in what Dr. Gruening said about the use of gauze in the brain, that he was led to use improved gauze because of the danger of leaving a foreign body there, but I can assure the doctor that if he leaves any foreign material there he can pick it out by the assistance of the encephaloscope.

Dr. Bacon :—According to my experience, vertigo and

a staggering gait are the most common symtoms found in cases of cerebellar abscess. I did not understand Dr. Gruening to say whether the pus was very thick or not. I have found in a good many of my cases that the pus was so very thick that it had to be scraped away with a curette. It seems to me that these cases are the most unfavorable and the most difficult ones the otologist has to treat. As a rule the prognosis in cases of cerebellar abscess is unfavorable.

Dr. Dench:—It seems to me that one point which should be particularly emphasized in cases of cerebellar abscess, is the fact that they give rise to so few symptoms. I remember a case of mastoiditis operated upon several months ago. The patient was a boy five or six years of age. I performed what I believed to be a very thorough operation, and did not think it possible that a single softened spot in the mastoid had been overlooked. The patient did well for five days. His temperature was practically normal, and he took his nourishment regularly. He slept a good deal of the time, but when aroused seemed perfectly bright. I changed the dressing on the fifth day, and was at once impressed with the very foul odor which came from the wound. The dressing was removed. A careful examination was made of the wound, but no sinus in the bone was detected; the dressing was reapplied. The next morning the patient's temperature suddenly rose to 104°, and he died before I could reach the hospital. The autopsy showed a cerebellar abscess, lying just below and internal to the lateral sinus. There was a small perforation, the size of a pin-head through the bony wall of the sigmoid groove, leading directly through the lateral sinus and into the abscess cavity. This carious spot had been overlooked at the time of operation.

Dr. Richards:—I had a case some time ago very similar to Dr. Dench's case. Patient was a boy four or

five years of age. I found a cerebral abscess, opened it, drained it. At all the subsequent dressings there was a great deal of cerebro-spinal fluid, probably from the ventricles, and a very foul odor to the dressing. There was very little pus, and we did not seem to be able to find where the bad odor came from. He slowly failed, the temperature went up high and he died the third week after operation. Autopsy showed combined cerebral and cerebellar abscess. The cerebellar abscess was not known about or suspected before death. The lesson, it seems to me, for us in these cases, is, when there is a foul odor, to hunt for the cause until we find it.

Dr. Tansley :—There is one point which I have not heard mentioned during this discussion, and that is that in these cases of abscess of the cerebellum the patient turns his eyes away from the seat of the lesion. If the lesion is in the left lobe he continually turns his eyes to the right, while if the abscess is in the right lobe, he turns his eyes to the left. There being no paresis, the patient can bring the eyes to and beyond the median line.

Dr. Randall :—I have noticed in some of these cases a nystagmic tendency, which at times seemed to be the only indication of abscess, and usually the nystagmus seemed to be toward the affected side. It is really a slight paresis which shows itself as a nystagmus in the effort to look toward the affected side—a point which is very interesting, and Spiller believes it is important.

Another point which is interesting is that in puncturing for pus an abscess may be overlooked or not found. I remember a case where there was no lowered pulse nor temperature, only persistent pain and this nystagmus, so we decided there must be pus in the anterior portion of the cerebellum, and from three to five punctures were made in that region, and yet the knife passed by an abscess as large as a half dollar, but hardly thicker than a coin, leaving it untouched.

Dr. Gruening:—The only thing I wish to say in closing the discussion is to refer to the use of gauze in the brain which has been mentioned. I lost my first case because I used a tube. I believe it was the consistency of the tube that did the mischief, and that the brain was injured by the hard substance of the tube. This first case taught me not to use a hard substance. It is necessary to drain such a cavity. I think one or two strips of selvaged gauze will be sufficient to drain the cavity.

This is the third case of brain abscess which I succeeded in saving. They were treated with gauze and not with syringing.

In regard to the point which Dr. Whiting made, I think it is far better to put in gauze which does not leave any fibres behind.

In regard to the consistency of the pus in these cases, it was greyish-white pus, and it was not very thick, if I remember rightly.

A CASE OF ACUTE OTITIS MEDIA AND SINUS THROMBOSIS; MASTOIDECTOMY; EXCISION OF INTERNAL JUGULAR VEIN: SEROUS MENINGITIS; EXPLORATORY CRANIOTOMY. DEATH. AUTOPSY.

By Edward Bradford Dench, M. D., *New York*, N. Y.

C. A., age eight years, came under my observation at the New York Eye and Ear Infirmary, suffering from an acute inflammation of the right middle ear. When I first saw the patient, the disease was of about three days' duration. The boy had been suffering from intense pain in the ear. On examination, I found bulging of the drum membrane, most marked in the posterior portion, and there was some tenderness over the mastoid process, especially at the tip. The upper wall of the canal, close to the drum membrane, was slightly sunken, but not markedly so. The patient walked with his head slightly inclined to the right side, as if the neck were stiff. A free incision was made through the posterior segment of the drum membrane, and the ear was ordered to be irrigated every two hours with a $\frac{1}{5000}$ solution of bichloride of mercury. Two days later, the patient reported again. The neck was still stiff, but the incision had given complete relief to the patient for about twenty-four hours. The night before his second visit, however, he had not slept well. The mastoid tenderness was somewhat less than at his previous visit. The ear was discharging very profusely, and the opening through the drum membrane seemed sufficient to ensure free drainage. The child was, therefore, sent home, with

orders to continue the irrigation as before. Three days after I again saw him. At this time the discharge from the ear was scanty, the pain had been continuous and severe since the last visit, the neck was more stiff, and there was decided tumefaction below and behind the tip of the mastoid process. The patient was admitted to the hospital, and immediately placed upon the operating table. The mastoid was opened in the typical manner, the antrum being first opened; neither pus nor granulation tissue was found, and the antrum seemed in an absolutely normal condition. On exploring the mastoid tip, considerable pus was found in the tip cells. On opening these cells, the pus within them pulsated, and further exploration showed that this pus was in immediate contact with the outer wall of the sigmoid portion of the lateral sinus. The tip cells were removed and the sinus exposed for a length of about three-quarters of an inch. On incision of the sinus a firm clot was found to occupy its lumen. The curette used in the upward direction removed the clot and free hemorrhage followed. The curette introduced into the sinus, in the direction of the jugular bulb, removed fragments of the thrombus, but no hemorrhage followed the curette. I, therefore, immediately proceeded to excise the internal jugular vein. The vein was removed from a point just below the omohyoid muscle to a point just below the base of the skull. The deep cervical lymphatics were considerably enlarged, and their excision rendered the operation a tedious one. The vein contained fluid blood, but was very narrow at its upper portion, undoubtedly due to the infiltration of the wall of the vein. The incision in the neck was closed by interrupted sutures, the ordinary dressing applied, and the patient put to bed. He did very well, and the dressings were changed upon the third day. The central portion of the wound in the neck had united, but it had broken down both at the upper and lower end of

the incision, and there was found to be considerable pus beneath the superficial tissues. Up to that time, the patient's temperature had ranged between 99° and 103° and the pulse between 80 and 120. The child had seemed perfectly bright, had answered questions intelligently, and had complained of no pain. The dressing was changed again on the next day and the child appeared to be doing well. On the following morning, the child appeared to be stupid, and the temperature was slightly elevated; the pulse, however, became steadily slower; in the morning it was 62, at noon it was 72 and when I examined him in the afternoon it was only 42. At the time of my examination, the patient was somewhat dull, but responded readily to questions. He named objects shown him, and recognized members of his family and the attendants, although his answers were slow and he seemed somewhat dull. An examination of the eyes at this time revealed a beginning optic neuritis upon both sides, slightly more marked in the right eye. The field of vision was normal in both eyes and there was no impairment of motion of either eyeball. I might say here that the eyes had been examined immediately after the primary operation, and the discs had been found to be perfectly normal in both eyes. Another symtom which the patient presented, was a condition of catalepsy. This cataleptic state involved both the lower and upper extremities; both arms and both legs being raised in any position, they were held in this position by the patient for a considerable period of time; in fact, they remained in the position placed indefinitely. Owing to the slow pulse, the optic neuritis and the cataleptic condition, I felt convinced that there was some increased intracranial pressure. From the involvement of the parts found at the primary operation, it seemed possible that there might be an abscess of the cerebellum, although, from the short duration of the inflammation, this seemed rather im-

probable. It was rendered more improbable from the fact that there had been no nausea or vomiting, no disturbance of equilibrium, as far as we could determine, and no mystagmus.

The patient was placed upon the operating table and an incision was made at right angles from the centre of the original mastoid incision, backward for about two inches. The cerebellar dura was rapidly exposed behind and below the lateral sinus. The dura in this region was deeply injected and conjested. A dural flap was then turned down and the cerebellum immediately bulged into the wound. The knife was passed deeply into the cerebellum in several directions, but no pus was evacuated, although the brain tissue seemed exceedingly soft, and what might be termed "liquified brain tissue" exuded from the margins of the incision. The deeper incision of the knife was followed by the gush of clear serum, and I at once appreciated the fact that the incision had entered the fourth ventricle. This serous fluid confirmed the diagnosis of serous meningitis. A light packing was introduced between the margins of the incision in the cerebellum, care being taken not to carry this strip of gauze deeply. The exposed cerebellar area was covered with sterile gauze, the posterior angle of the wound satured, the ordinary dressing applied, and the patient returned to bed. It is hardly necessary to say that, throughout the operation great care was taken to prevent infection of the operative field through the wound in the neck or from the exposed sinus, these regions being carefully covered by pads of sterile gauze, held by assistants, so as to maintain a thoroughly aseptic field of operation. The next day the patient seemed decidedly brighter and the pulse was about 100. There was a free exudation of serum from the incision in the cerebellum; this discharge was so profuse that all the dressings were saturated. From this time on, the dress-

ings were changed every day. At the first dressing a large hernia cerebelli was found, consisting mainly of granulation tissue and blood clot, with some brain tissue; portions of this were removed at each dressing. For eight days after the operation the patient continued to improve. On about the fourth day after the operation he seemed slightly dull and took his nourishment with some difficulty. In twenty-four hours, however, this difficulty had passed away, and the child seemed to be doing well, as I have said, on the eighth day after the operation. The hernia, however, still remained large, and portions of the mass were removed at each dressing. The wound in the neck resulting from the removal of the jugular gradually became healthy; there was no breaking down of the wound excepting of the upper and lower extremities, before mentioned, and the pus discharge from this was very slight at this time. On the ninth day, after the second operation, the patient seemed remarkably well; he appeared brighter, took his nourishment well, the pulse was fair in quality, and he seemed in every way better. Early on the morning of the tenth day, after the second operation, the child suddenly went into collapse, the breathing became rapid, and he died early in the afternoon of the tenth day.

For the pathological report of this case, I am deeply indebted to my friend and colleague, Dr. George S. Dixon, and it is with his collaboration that the following portion of the paper is written. The aural pus showed the presence of pneumococci, and the clot taken from the sinus at the time of the operation showed the presence of a diplococcus and of an unidentified bacillus. Dr. Dixon is inclined to believe that the diplococcus found in the sinus was a pnemococcus, identical with that found in the aural pus.

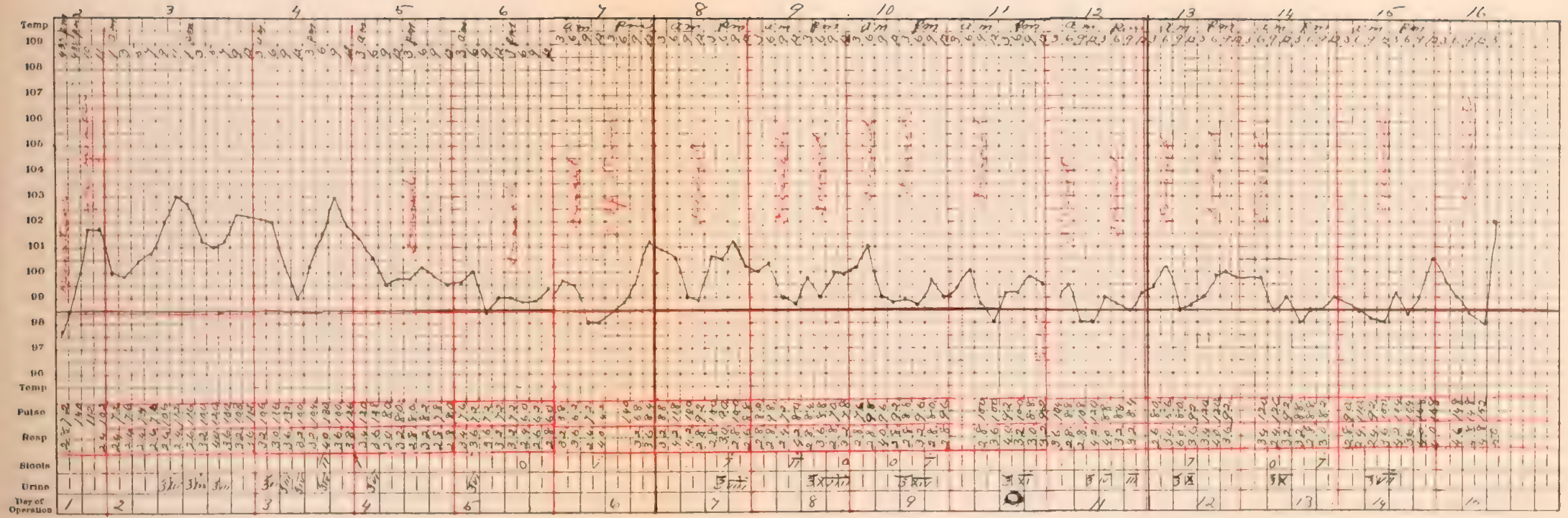
The report of the autopsy is as follows:

External examination. Both pupils dilated, the right

slightly more than the left. A hernia protruded from the mastoid wound on the right side. The operative wound along the inner border of the sterno-mastoid muscle was healed in the middle, but open at both ends; very little pus was present.

Examination of the cranial cavity. A moderate serous leptomeningitis was present. A small amount of plastic lymph was found along the left side of the longitudional fissure. Within, the longitudinal fissure was normal on both sides. There were adhesions about the mastoid wound and also about the foramen magnum. A clot of considerable size was found attached to the extreme upper end of the cord posteriorly, and extending into the vertebral canal. It had the appearance of membrane carrying extravasated blood. At least two thirds of the right cerebellar lobe was destroyed. A blood clot estimated as two inches long one inch wide and from a third to a quarter of an inch thick, was found in the cerebellar fossa, which was probably post-mortem. All portions of the base of the skull were normal, the right mastoid region, of course excepted; the ventricles were normal, except the fourth. The only abnormality here was an opening about the size and shape of the end of an ordinary grooved director, through the lower part of the wall on the right side.

The hernia was composed mainly of red and white (polynuclear,) blood cells held together by fibrin and necrotic cerebellar tissue; the surface presented in sections, numerous diplococci and a bacillus, both organisms apparently being the same as those found in the specimen of the sinus submitted for examination. The diplococci found in the sections were probably pneumococci, as the aural pus presented this germ on previous examination. The membranous-looking mass passing into the posterior portion of the vertebral canal, proved to be a clot, carry-


Temp
Pulse
Resp
Stools
Urine
Day of Operation

ing a large number of leucocytes; no germs were found in it.

The cause of death was undoubtedly hemorrhage into the spinal canal. A further examination of the cerebellum showed that the cerebellar tissue adjacent to the broken down or hernial tissue, presented an infiltration of leucocytes in layers or striae for a short distance inwards. There were no broken-down areas or evidences of deposits of pus, such as would occur in a pure encephalitis, in the deeper portion of the cerebellar lobe below the base of the hernia.

The infiltration, mentioned above, in the deep cerebellar tissue, occurred in that portion of the cerebellum which lay very close to the infected sinus. It seems probable, from a clinical point of view, that this infection spread through the wall of the sinus and attacked the deeper cerebellar tissue, and that later, a more extensive infiltration of the cerebellar lobe occurred, giving rise to pressure symptoms, which necessitated the second operation. On incising the cerebellum, it will be remembered, that the brain tissue seemed exceedingly soft, and that broken-down brain tissue exuded from between the edges of the incision. It seems more than probable, therefore, that the infection spreading in the deeper portion of the cerebellum, was responsible for this softening; and that this infection not only spread to the cerebellar tissues, but also to the ependyma, giving rise to the serous collection found in the ventricle at the time of the operation. This oedematous condition of the cerebellum would account for the increased pressure in the cerebellar fossa, and the extensive hernia cerebelli. The fact that the germs found on the surface of the cerebellar hernia were identical with those found in the aural pus, at the time of the first examination, would seem to show that the infection had extended directly from within outward, in the manner described. As the patient

was doing well until a few hours before death, it seems evident that the rupture of some large vein at the base of the cerebellum was responsible for the death. Had this accident not occurred, it seems more than probable that the patient would have recovered completely.

The case is of interest not only from a pathological, but also from a clinical point of view. We have ordinarily been taught to believe that the fourth ventricle could hardly be entered with safety. In this case, the fourth ventricle was opened, and yet the patient survived the operation more than a week; that the cause of death was in no way connected with the opening in the fourth ventricle, the autopsy clearly proved.

I have previously reported a single case, in which the fourth ventricle was opened during an exploration of the cerebellum, and in this case also, although the patient lived a number of days after the operation, there was absolutely no inflammation of the lining membrane of the ventricle.

THE DIFFERENTIAL DIAGNOSIS OF ACUTE AND CHRONIC BRAIN ABSCESS BY MEANS OF THE ENCEPHALOSCOPE.

By Fred. Whiting, M. D., *New York, N. Y.*

A consideration of the simplicity and meagreness of the surgeon's armamentarium of a few years ago in comparison with the present lavish surgical equipment, with its multiplicity of time and labor saving devices, forces upon us the conclusion that surgeons were formerly men of extraordinary fertility of resource in adapting their few appliances to the exigencies of the clinical situation ; or we must assume that the organs and members of the human body have in recent years, under the enervating influences of modern luxury and indulgence, fallen prey to a countless number of complex surgical maladies, for the relief of which numberless indispensible instruments have been devised, which endless list a heterogeneous array of less meritorious modifications and substitutes for the same has appreciably augmented.

The medical profession is unfailingly charitable in its criticism and accepts as praiseworthy the spirit which is constantly striving for higher standards of efficiency, either of method or device, as an evidence of which indulgence witness the catalogue of the surgical instrument maker and note its ponderous size and voluminous contents. From the interminable lists which adorn its pages, it would appear that nearly every doctor is responsible for at least one instrument of his own in addition to several modifications of those of his colleagues. The absolutely indispensible

appliances have indeed become so numerous, judging by the enthusiastic advocacy of their various sponsers, that the announced intention of adding still further to the number is gradually coming to be regarded as rather an imposition, and while such an announcement does not as yet constitute a direct reflection upon a man's professional standing and respectability in the community, it is wise at least to preface it with an apology which should be becomingly modest.

Such an apology the author now offers, and at the risk of adding still another to the ever lengthening list of appliances which will perhaps be characterized as worthless, I desire to present before the society an instrument which has been named, because of its avowed purpose of inspecting the interior of the brain, the encephaloscope.

I have no desire to substantiate any claim for originality of invention so far as the mechanism of the instrument is concerned or as regards the method of illuminating a cavity, for the device represents simply the principles of the cystoscope or proctoscope, so modified as to conform to the requirements of brain surgery, and the only claim which I hope to establish is that of priority of application of such method of illumination to abscess cavities in the brain.

A long time ago I became convinced that the method employed in dressing brain abscess added very considerably to the gravity of the patient's condition, and to the ultimate percentage of mortality as well. My attention was called to this fact because of the observation that case after case of acute brain abscess would die after appearing to be doing very well for several days succeeding an operation which had relieved the patient, temporarily at least, of the most urgent and threatening symptoms. After a few dressings there would gradually reappear the characteristic manifestations of acute purulent encephalitis, which thereafter progressed rapidly until meningitis or ependymitis supervened and death ensued. I was accustomed at first

to consider that infection had spread from the abscess cavity by means of veins or lymphatics which had undergone erosion as the result of unavoidable extension of the purulent process into contiguous tissue and I did not then appreciate that faulty technique was to any great extent responsible for the mishap.

The findings of two autopsies, however, furnished valuable food for reflection, for in each instance when the brain was cut and the abscess exposed, there appeared discolored and softened areas of brain tissue radiating from the abscess wall and the drainage channel at varying angles and extending to various depths, which infected areas corresponded to fistulous paths which had been made in the course of dressings in attempts to introduce gauze into the abscess cavity along a canal which could not be inspected. These infected tracts had been made after the same manner as false passages are produced in the urethra by misdirected sounds, after seeing which I realized, for the first time, how probable it was that faulty technique had contributed to a considerable extent to the unexpected fatalities in those cases which had appeared so promising immediately after operation.

That laceration of the brain should ensue upon an attempt to introduce gauze into the abscess cavity through a narrow opening and along a channel, the walls of which are collapsed and in contact, when not supported and separated by retaining gauze, a careful consideration of the anatomical relations will show to be nothing more than might reasonably be expected.

An acute brain abscess has a *limiting wall of fibrin of such delicate texture and scanty resistence* as to offer, after evacuation of the abscess contents, little or no opposition to the tendency of the brain with its soft, pulpy consistence, to collapse the walls of the abscess and prolapse toward the opening made in the dura at the time of operation, under

which circumstance any attempt to introduce gauze drainage by the usual method is attended with serious risk of making a false passage with the probe and gauze, thereby conveying infective material into hitherto entirely healthy brain structure. That such an experience is a most likely result, observations upon the autopsied brain have satisfactorily demonstrated. In fact, I think it is not too strong to affirm that such infective paths can be avoided without the use of the encephaloscope only when the abscess is very superficial and shallow, that is, near the cortex, or when extraordinary (and not to be usually expected) good fortune attend upon the post operative ministrations of the surgeon. It is a very simple matter to introduce gauze through a small opening, beyond which one cannot see, into a cavity with rigid walls in such manner as to entirely fill the space and so dispose the gauze as to maintain uniform pressure upon all sides; but it is an entirely different proposition to carry gauze to the bottom of a deep cavity, the opening of which is small and channel leading down to which is narrow, with delicate walls, which will be wounded or lacerated at any point where the probe carrying the gauze deviates in the least from the direction of the passage for discharge from the abscess cavity.

The remarkably successful results reported in the operation for brain abscess by Macewen have not been duplicated by any operator, either in Europe or America so far as the records will show. To just what extent his operative technique may be instrumental in his unrivalled success can only be conjectured, for he has never described in detail his procedures, and the inference would be that his operation differs in no essential particular from that of his colleagues. Whether or not he has been so fortunate as to encounter in his long series of cases a number of men who were extraordinarily robust and hence very favorable

subjects for operations cannot be substantiated, and there is no reason to suppose that such is the case. Regarding drainage of the cavity, he says that decalcified turkey bone furnishes adequate and satisfactory drainage, and as soon as it is introduced, he stitches the dura about the drain for the double purpose of keeping it in position and preventing cerebral hernia. In my own cases and such as I have heard of from my colleagues, this kind of drainage has not proved efficient, for it has become obstructed and ceased to drain, and its removal has become imperative. Gauze, which has been substituted in its stead, has been found more satisfactory and reliable, although from Macewen's description we would infer that decalcified turkey bone left nothing to be desired as an admirable drain.

The encephaloscope is an instrument so simple in construction as to require but a brief description. Like the cystoscope and proctoscope, it consists of a hollow metal tube with a flaring orifice and slightly contracted extremity, giving it an appearance very similar to an enlarged type of ear speculum. Upon the brim of this tube and parallel with its long axis a slot is attached, into which a handle or grip is inserted at right angles to the long axis of the tube, with a universal adjustment controlled by a screw, in order that the hand holding the instrument may accommodate itself to any position of the patient's head without constituting an obstacle to the vision of the operator. Into the hollow metal tube an obturator fits in such a manner as accurately to occlude the extremity and preclude the possibility of any laceration of the soft brain substance, which must be displaced or thrust aside when the instrument is introduced into an abscess cavity. The handle of the obturator projects from the proximal end of the tube a sufficient distance to admit of its being readily grasped between the thumb and finger and quickly withdrawn or as speedily replaced, should circumstances require.

Two sizes of this instrument are provided and they have appeared to the writer to answer satisfactorily the purposes for which they were intended, the larger one being sufficiently wide for visual exploration within any abscess cavity, however extensive its dimensions may be, while, when the abscess contracts until it no longer admits of inspection by the smaller one, the necessity for the introduction of gauze packing for drainage will have ceased. It has not, therefore, seemed necessary to me to add others of different diameter to the two originally designed, and they are now presented for the inspection of those members who may care to examine them.

By means of the encephaloscope it is possible to determine absolutely whether we are dealing with acute or chronic brain abscess, for the pictures revealed by the instrument under acute and chronic conditions are in striking contrast. The appearance of the walls of the abscess cavity in acute purulent encephalitis is not unlike that of some space lined with delicate mucous membrane, the color of the surfaces under inspection varying from a very pale pink to a more pronounced reddish hue in proportion as the degree of inflammation is of moderate or great severity. In none of the cases observed by me has there been at any time the deep cyanotic red color to the inflamed brain tissue which is sometimes observed at autopsy, closely simulating red hepatization and which it seems most likely is due to embolus or post mortem change. Upon these pinkish walls will be seen, scattered here and there, thin shreds of plastic lymph, *which nowhere assume the proportions of an investing layer*, punctuated here and there with hemorrhagic spots of greater or less size, but one does not detect at the time of operation or until several days later the presence of granulations upon the walls of the abscess cavity, although they are undoubtedly present, but so minute as to be unrecognizable, in which respect

the picture differs radically from the appearances of chronic brain abscess. In no case of acute purulent encephalitis which I have so far observed has there been any limiting wall of fibrine *which was plainly recognizable as such.* With chronic purulent encephalitis the picture which the encephaloscope discloses is that of a dense, yellowish-white opaque membrane of firm consistency, completely investing the walls of the cavity which is being explored, like a hard, fibrous capsule; this capsule seldom or never presents a smooth or homogeneous surface to the observer, but is, on the contrary, distorted and irregular in shape, with numerous folds or ridges disposed about the sides in fantastic arrangement, much after the manner of a shrunken and shriveled bladder of some sort. The thickness and density of this abscess capsule is in some instances truly remarkable, and in one case which I observed the walls, after evacuation of the purulent contents, did not collapse to any appreciable extent during the time they were under inspection, perhaps five minutes, but sustained the pressure of the surrounding brain almost as if they had been composed of some unyielding structure and when interrogated by the cotton tipped probe, conveyed to the examiner a sense of resistence not unlike that of the reticular cartilage of the auricle. When the first dressing was made, twenty-four hours later, the abscess walls had succumbed to the persistent brain pressure and were collapsed and already beginning to soften, as indicated by probing and by loss of sharp definition of outline which had characterized the folds of the lining plastic membrane at the time of operation. Granulations presenting upon the surface of the sack and projecting into the interior are by no means constant manifestations. In some instances the inner wall of the sack is quite devoid of them, while others again display tufts and bunches of varying size and shape protruding from the thick mass of lymph and bathed in pus;

around and upon these granulations ramify newly formed inflammatory vessels with very thin walls, which rupture easily and cause annoying bleeding if manipulation is accompanied by the exhibition of undue force. The granulations which are commonly encountered protruding through the lymph sufficiently far to be visible by means of the encephaloscope are, for the most part, *bright red, laudable granulations*, springing from healthy brain matter situated immediately beneath them, and toward which they exercise a distinct protective agency, being, under favorable conditions, converted into healthy connective tissue. Occasionally, however, there appear *granulations of quite different character and significance*, and in the single instance in which I have observed them, they were situated at the deepest and most dependent portion of the abscess cavity; in appearance they were precisely similar to the necrotic granulations which so frequently accompany extra dural abscess, dark blue or nearly black in color, and individually very large, they have outgrown their nutrition, are filled with soft, pulpy material and pus, are in process of sloughing, and under no circumstances will they undergo a productive inflammation. They are of the same significance as necrotic granulations about the orifice of a fistulous tract, leading down to a sequestrum or other carious focus, and in the chronic brain abscess in which I noted them, they were not growing upon a firm, supporting base of lymph, but, as I learned later, indicated the situation of an extension of the infective process further into the brain, at which point the investing wall of lymph was entirely wanting or had softened so it could not be recognized by probe, and at autopsy was not found. Whether the inflammatory capsule had originally included all of the infected area and had subsequently undergone absorption at the point described, with consequent extension of disease into the contiguous healthy structure,

or whether the situation of the necrotic granulations represented the original infective focus, from which, as a base, the process had spread, with formation of the dense, limiting fibrous wall which never included the original ulcerative area furnishes food for interesting reflection and speculation. From my limited experience, I am led to believe that the presence at any point upon the abscess wall of masses of necrotic granulations must be regarded as a manifestation of important pathological significance and of most unfavorable import, for in all probability at every such point the protecting wall of lymph will be found imperfect, or possibly entirely wanting, and we are justified in the suspicion that infected brain tissue lies immediately beneath and perhaps extends to a considerable distance beyond.

The clinical value of the encephaloscope may be considered, first, in the assistance which it affords at the time of operation, and, second, in the service which it renders during post operative treatment. What ready information does the instrument enable us to gain at the time of operation which is otherwise obtained with difficulty and uncertainty? First, we can determine positively whether evacuation of the purulent contents of the abscess is complete, a fact which digital examination cannot demonstrate. Second, we can determine whether there exist any plastic bands which interfere with drainage. Third, we can determine whether we are dealing with an acute or chronic brain abscess, the prognostic importance of which cannot be overestimated.

Regarding the first consideration, namely, complete evacuation of the contents of the abscess, it has been the practice of some surgeons, after pus ceased to flow from a brain abscess, to introduce a forceps of one kind or another, and by opening the blades to divulse the wound, and in this manner to assist the flow of pus, which is usually

retarded or obstructed by shreds of lymph and necrotic tissue. Others, again, prefer to use the finger, considering that investigation by that member is safer and more intelligent than instrumental exploration. There are still other operators who deem it expedient to assist the removal of retained pus and other infective products by irrigating the cavity with a solution of boric or salicylic acid, such indeed being the practice of Macewen. Against each of the above mentioned methods there is objection to be raised, and against irrigation especially, for if it be employed in acute abscesses, even with the most scrupulous care there is danger of rupturing the wall of the abscess and of disseminating infective material into adjacent healthy structures. When the abscess cavity is very large, there is often but a thin layer of white matter separating it from the lateral ventricles, and even a very moderate force imparted to the irrigating stream might cause rupture into the ventricles. It is indeed no uncommon experience, when introducing gauze packing into a deep abscess, without the assistance afforded by the encephaloscope, to puncture the ependema and cause evacuation of the ventricular fluid, thus adding an unnecessary element of risk to a condition already sufficiently serious. Exception is taken to the other methods of emptying the abscess cavity because they must be executed without visual aid, and are likely to cause injury, particularly if the cavity is deeply situated.

To the encephaloscope, however, none of the foregoing objections can be justly raised, for it does not subject the tissues to any traumatism whatever, requiring no greater force in its introduction than a simple introduction of the finger demands, and being entirely free of the objectionable features of the divulsing forceps. The three former methods, in addition to subjecting the brain to additional traumatism, are not by any means convincing in their demonstration of complete evacuation of the abscess, while

the encephaloscope, introduced slowly, by degrees exposes to critical inspection every portion of the abscess, from the opening in the brain cortex to the bottom of the cavity, and if any pockets or subdivisions exist, they are readily recognized and can quickly be made tributary to the principal cavity. The procedure is one of the utmost simplicity, and when properly performed offers entirely satisfactory evidence that the evacuation of the contents of the abscess is complete.

The efficiency of the instrument in accomplishing evacuation of the contents of the abscess was well demonstrated recently. I had opened an abscess in the temporo-sphenoidal lobe, from which a large quantity of pus escaped, and upon stroking the brain from below upward, there was a further copious discharge, but thereafter no more appeared until the encephaloscope was introduced, when pus welled up within it and filled it full three times, successively, each supply being drawn off. This phenomenon was due to the fact that the abscess was of the chronic variety whose rigid walls did not yield to the collapsing pressure of the surrounding brain, and hence only the excess of pus lying above the level of the opening in the sac had escaped, the remaining contents being retained as if in a cup with vertical, unyielding sides.

Second, regarding the presence of plastic bands which interfere with drainage, and which many surgeons claim to be able to detect by the aid of the finger, it is sufficient to say that they are smoothed away by the simple introduction of the instrument, and may thereafter be disregarded as obstacles to drainage.

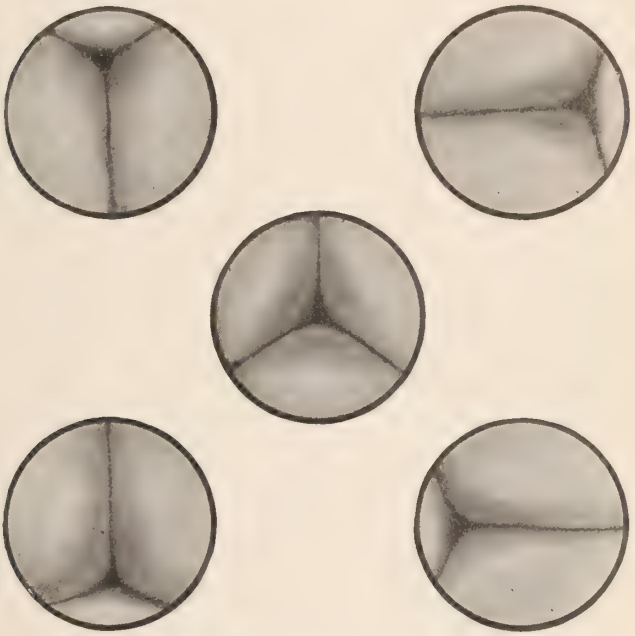
Third, the determination of whether or not we are dealing with a chronic brain abscess is very easy, for the appearances already recited in detail differ so radically from acute manifestations as to be unmistakable.

What assistance does the encephaloscope render in the

post operative treatment of brain abscess? It enables the examiner to carefully scrutinize the entire path of the abscess, down to the bottom, and to recognize early any new area of infection; it also renders needless all laceration of the delicate brain structure contiguous to the abscess wall in the process of introducing gauze, either in a single wick or in a large quantity, the method of which procedure is to be described a little later.

The method of employment of the encephaloscope, either at the time of operation or during the post operative treatment of brain abscess for the purpose of making dressings, is exceedingly simple and does not require any detailed description; there are, however, certain precautions to be observed in its introduction, a brief mention of which may not be inopportune. Having assured himself that the obturator, although accurately closing the extremity of the tube, is easily movable, so that it can be withdrawn without sticking and requiring a jerk to dislodge it the operator should hold the instrument in the left hand and introduce it into the opening in the dura to a depth not exceeding one-half an inch, at which depth the obturator should be gently withdrawn with a slight rotary pulling motion from right to left like the reverse turn of a screw. Simultaneous with the withdrawal of the obturator the interior of the instrument is illuminated by means of the head mirror, in the same manner as is practiced in examining the fundus of the ear, when the inflamed abscess walls are seen presenting and prolapsing very slightly into the lumen of the encephaloscope. The object of removing the obturator thus early in the manoevre is for the purpose of acquainting the operator with the exact direction which the channel pursues through the brain, in order that the instrument may follow it throughout its course, and thus avoid inflicting even the slightest traumatism.

When an examiner looks through the encephaloscope, he notices that the collapsing walls come in contact with one another except at one point, where there is a slight depression, which, of course, corresponds to the situation and direction of the drainage path; should this small pit lie in the centre of the field of observation, the obturator will be immediately placed in the tube and the instrument carried one-half inch deeper still into the brain and straight forward, since the direction of the drainage path is manifestly straight in that part of its course. See diagram.



Diagramatic Representation of Encephaloscopic Field Indicating Direction of Abscess Path.

When the obturator is again withdrawn, the small guiding pit or concavity may no longer correspond with the centre of the field, but may be situated below the centre or

to the right or the left or above, which signifies, when interpreted, that the direction of the drainage canal, owing to shrinking, cicatricial contraction and filling with granulation of the abscess has deviated in its deeper portion from the direction pursued in the more superficial or peripheral part of its course. The proper procedure under such conditions is to incline the extremity of the encephaloscope in a direction corresponding with the depression and to carry it by gradual stages and repeated observations into the brain until the bottom of the pus sac is reached, which will be recognized by its terminating like the tip of a glove finger. Should the examiner experience any doubt or uncertainty from the picture displayed in the encephaloscope as to whether he has arrived at the bottom of the abscess, he can quickly assure himself of his position by gently interrogating the presenting surface with a probe or applicator tipped with sterile cotton; the circatrizing surface, if present, will resist his enquiring touch, while if the drainage canal extends deeper, the cotton guarded probe will follow it and be partly buried from view in it.

So far as the writer's limited personal experience with the encephaloscope would warrant him in expressing an opinion, he is convinced that the method employed in dressing acute brain abscess should differ materially from that followed in chonic brain abscess. In acute purulent encephalitis, after the pus has been once fully evacuated, it seldom reaccumulates in large quantities, except when there has been extension of the infective process into contiguous structures, and since the amount of lymph is very scanty, not constituting in any case so far observed anything near a complete investing or limiting membrane, there is but little material present in such an abscess which should unduly prolong suppuration or delay repair. It seems wise, therefore, in such an inflammation, to reduce the gauze packing to the very least thread which

will maintain a pervious channel to the bottom of the abscess and conduct to the surface such scanty discharge as a healthy, granulating tract supplies, but under no circumstances to introduce sufficient gauze to distend or balloon the abscess cavity, for such distension serves no purpose other than to maintain needless and harmful increased intracranial pressure and to contribute to the risks of cerebral hernia.

The requirements of the acute condition I have found to be best satisfied by the introduction to the bottom of the cavity of a single wick of iodoform gauze of the size of a crow quill, which dressing is to be changed at intervals of forty-eight hours until the surface exposed to view by the instrument is seen to be covered by a layer of small, pinkish granulations; as soon as this appearance, which sometimes supervenes in an amazingly short time, is manifest, the length of the gauze drain should be decidedly reduced and the depths of the abscess permitted to heal preliminary to complete closure of the drainage channel from the dura inward. It not infrequently, in fact, usually, happens that a small cerebral hernia is found protruding through the dural opening, and before the encephaloscope simplified the method of treatment so materially such an accompaniment of brain abscess constituted a decidedly annoying and sometimes most embarrassing complication. Under the present conditions, however, but little concern is occasioned by the presence of hernia (unless it be of extraordinary size, which it seldom is) for as healing progresses it gradually shrinks, being in part strangulated by the contraction of the cicatrix which closes the opening in the dura and causes sloughing, and being in part absorbed by and incorporated with the scar tissue which ultimately constitutes the tegumentary coverings of the field of operation.

The nature of the tissue with which we are dealing renders opportune a suggestion with regard to the extent of

manipulation to which such structures may with safety be subjected.

In the treatment of abscess elsewhere about the body the interior of the sac, after pus has been evacuated, is seldom or never subjected to critical inspection, and the cavity, after being cleansed, is packed with gauze and left to the benign influences of nature in anticipation of satisfactory and reasonably prompt healing. When using the encephaloscope in the brain, however, every portion of the abscess wall is carefully scrutinized from day to day, and the examiner is sometimes tempted to display unwise and meddlesome activity in supplementing nature's slothful efforts at the removal of necrotic tissue and superfluous lymph, being momentarily obvious of the fact that the same process of separation is accomplished in abcesses in other tissues in the usual course of healing with perhaps, less expedition, but unquestionably, with greater safety; in other words, if we do not see these partially separated sloughs, we are content not to interfere, but when they are brought to our notice, nature's steps appear to us insufferably slow and in our impatience we cannot keep "hands off" or "let well enough alone."

It seems to the writer that it is injudicious, to say the least, to separate from the walls of a brain abscess small pieces of sloughing tissue unless such material can be wiped away with a cotton mop; all attempts at instrumental removal, (by forceps, curettes, etc.) of sloughing fragments should be discouraged as calculated to inflict needless and harmful traumatism.

The writer would advocate in chronic brain abscess a method of post operative procedure which is the direct antithesis of that which has afforded such satisfactory results in acute processes.

In chronic brain abscess there is present a dense, firmly resisting fibrino-plastic membrane which must slough away

or undergo absorption before the abscess channel may with safety be permitted to close; the process of sloughing is apt to be protracted and is accompanied by a profuse purulent discharge, which accumulates with such rapidity and often exhibits such putrefactive properties as to render daily dressing imperative. To an operator whose experience is limited to acute processes only, the quantity of offensive pus which is discharged from a chronic abscess in the short space of twenty-four hours is a source of astonishment, and must be encountered to be properly appreciated; in the first few daily dressings of a large chronic abscess the amount of discharge almost suggests the existence of a communicating abscess which is contributing the extraordinary supply by draining imperfectly into the cavity of the abscess which is under observation, and it is not until the thick capsule-like lining of lymph begins to slough and undergo organization that any sensible diminution in the quantity and alteration in the character of the discharge is apparent. The condition is somewhat analogous to an extensive sub-periosteal mastoid abscess, the purulent contents of which have been evacuated by simple incision, leaving the walls, which are lined with necrotic granulations and lymph to the slow process of gradual sloughing and organization instead of opening the sac widely, everting the flaps and subjecting the infected surfaces to a vigorous application of the curette, which would simplify the healing amazingly. The temptation to use the curette upon the sloughing walls of a chronic brain abscess is almost irresistible, particularly since the encephaloscope affords so excellent a view of every part of them, and the procedure, could it be performed with sufficient thoroughness, would undoubtedly materially reduce the difficulties and duration of treatment. There seems to be no positive contra-indication to such a step, if undertaken with great care and delicacy and satisfactory illumination,

except when the bottom of the abscess sac lies in close proximity to the ventricles, under which circumstances any attempts at curetting would be hazardous in the extreme and not for a moment to be countenanced. In judiciously selected cases, however, when the abscess is favorably situated, (not too deep) it seems to me that curettage of chronic brain abscess where the lining membrane is very thick, has little to condemn and much to commend it; in any event, when large tufts of NECROTIC granulations are seen upon the abscess wall they should be scraped away, lest, by remaining they be permitted to conceal a path of infection already extending into adjacent brain tissue.

The writer believes that it is necessary in the daily dressings of chronic brain abscesses first to mop the cavity thoroughly clean with sterile absorbent cotton and then to introduce sufficient iodoform gauze *to distend or balloon it;* a practice which must be continued and persevered with until all fetor disappears, the discharge is diminished greatly and the former lymph-coated suppurating surface is covered with small, red granulations, with the appearance of which manifestations, favorable and speedy healing may be anticipated.

The writer's experience with brain abscess is comprehended in a number of cases which arrange themselves logically into two groups, namely, those treated without the aid of the encephaloscope and those treated with the assistance of that instrument.

Without encephaloscope, 3 cases.	With gauze packing and with irrigation, 1 case, 1 death.	
	With gauze packing and without irrigation, 2 cases, 1 death, 1 recovery.	
Percentage of mortality,		$66\frac{2}{3}$
" " recovery.		$33\frac{1}{3}$
		100
With encephaloscope, 5 cases.	Gauze packing without irrigation, 5 cases, 1 death, 4 recoveries.	
Percentage of mortality,		20
" " recovery,		80
		100

The cases here recorded comprise all the brain abscesses upon which I have ever operated and do not represent cases chosen because of their applicability to statistical excellence. The members of the first group, so far as age, constitutional disease or other disabilities are concerned, differed in no material respect from the members of the second. The abscesses were all of the temporosphenoidal lobe, and all operated on in a similar manner, that is, as regards technique of procedure, administration of anesthetic, regard for antisepsis and the like. The chronicity of brain abscesses undoubtedly adds very greatly to the gravity of the condition, in which regard group one should profit statistically to the detriment of group two, for in the former there were no chronic abscesses while in the latter there were two; in which respect, at least, the prognosis should have been distinctly more favorable to the members of the first group. In neither group were the extremes of life represented, although the only death which occurred in the second group was in the case of a boy four years of age.

Statistical tables dealing with percentages of mortality and recovery in surgery are very unreliable data upon which to base an estimate of the value of any particular procedure, especially when statistics represent, as they usually do, a summarizing of the work of several men whose conceptions of the practical application of the mechanism advised to the operation in question are oftentimes widely at variance. To the results obtained by a single individual, however, in a series of operations, performed under essentially similar conditions, such an exception can hardly be taken, and if, in an operator's results in two groups of cases, there is a remarkable disparity in the percentages of recovery of the one over the other while the only material technical difference in the performance of the operation is based upon the employment of a particular

apparatus, it is then at least permissible to maintain that said operation results much more favorably at the hands of said surgeon when he employs said apparatus. This, at the present time, from lack of knowledge of the results of other men, is all that I am prepared to affirm; for the encephaloscope has been in use but two years, has never been described in any medical journal, and of course has never received general recognition. Exhaustive or convincing statistical information is therefore impossible to offer.

I simply desire to emphasize the fact that a much greater proportion of patients afflicted with brain abscess have recovered at my hands since I have employed the encephaloscope than formerly recovered from the same operation when I did not use it. It seems to me, therefore, that the claims of an appliance which can convert the statistics of any operator upon consecutive, unselected cases, from 66% mortality to 80% of recovery ought not to be lightly disregarded or thoughtlessly denied recognition.

In the opinion of the writer post operative treatment of brain abscess has never received at the hands of the general surgeons and otologists the consideration to which the importance of the subject entitles it. There are few more impressive or brilliant performances in surgery than the correct localization and prompt evacuation of an abscess in the brain, and there are probably but few occasions in a surgeon's career when he feels a keener sense of complacency and self-esteem than when, with apparent confidence he plunges his bistouri into the brain and sees with a thrill of delight which he scarcely dares credit, a stream of pus follow his fortunate stroke, and listens with seeming indifference but with actual unction to the flattering comments of the admiring house staff and onlookers regarding his profound knowledge of cerebral localization and general diagnostic astuteness, and being only human, he is to be pardoned if, in a moment of exaltation he forgets

the many less felicitous occasions on which with equal apparent confidence he has prodded his erring bistouri into brains less responsive and considerate of his vanity, and has been compelled to endure with corresponding mortification the patronizing assurance of that same fickle audience that "cerebral localization is not an exact science, but that it is simply great when it turns out as you expect it to." However, one brilliant success compensates for many failures, and if only the enthusiasm born of successful beginnings was of more staple substance, if it would serve to maintain the same feverish interest in the case through the weary weeks of daily dressing and other irksome details, we should know more about the post operative treatment of many conditions, brain abscess among others, and I am well convinced that such knowledge would confer a lasting benefit upon mankind not one whit less important than our operative triumphs. But dressings and bedside attentions must ever lack the excitement of the operating room, and the case which has been operated on seldom arouses the same interest as the case which promises future operative possibilities. After-treatment is a weak chapter in otology and in brain surgery especially so, notwithstanding that there is no field of surgery which offers greater inducement to conscientious study in the certainty of producing a result commensurate with the labor expended. It is my earnest hope that the encephaloscope will, with more general and intelligent use, contribute in some measure to a consummation so devoutly to be desired.

DISCUSSION.

Dr. Whiting :—I want to ask Dr. Dench whether the symptom of catalepsy is common in this condition?

Dr. Dench :—I think it is a symptom of increased in-

tra-cranial pressure, and is sometimes found in meningitis. It may be considered a symptom of this disease, although a rare one.

It seems to me that we have all been very much helped and instructed by this careful and scientific paper of Dr. Whiting's. Personally I am not inclined to believe that the very satisfactory results reported are due entirely to the use of the instrument, but am of the opinion that the excellent technique of the operator and the size of the abscess in the individual cases upon which he operated, had much to do with the favorable issue. I have used the instrument mentioned, in a single case, and believe it is of great value in introducing packing into the abscess cavity. And I consider this is particularly true as regards the after-dressings in these cases. At the time of the operation, I do not believe that the instrument affords any more information than may be obtained by the cautious introduction of the finger into the abscess cavity. I am also not entirely convinced that the instrument can be introduced quite as safely as can the finger at the time of primary operation. In view of the brilliant results reported by Dr. Whiting, however, I certainly have absolutely nothing to say against the employment of the method advocated by him. The only question which I would raise would be as to whether the instrument should be used at the time of the primary operation in cases of acute abscess, and before the abscess has become encapsulated, or whether its use should be restricted either to cases of chronic brain abscess or to subsequent dressings of acute cases, after the walls of the abscess cavity have been covered with granulation tissue.

Dr. McKernon :—I have had the pleasure of using Dr. Whiting's encephaloscope in three cases, and I want to add my testimony, particularly as to the use of this instrument in post-operative dressings. In one case I had supposed

after the evacuation of pus, that every particle in the locality had been evacuated, but on using the encephaloscope, and exposing the deeper structures of the brain, I was very much surprised to see the encephaloscope completely filled with pus, and on cleaning that out, and inserting the instrument deeper, more pus still presented itself. I think it is also very useful in examining the abscess wall, and in this way we can often determine the character of abscess we are dealing with.

Dr. Whiting :—I can only say that I am much gratified if any of the members of the society have found the encephaloscope of use. I think it is very useful in differential diagnosis.

A point which I think has not been touched upon. That is, curetting of a brain abscess. I was hoping somebody would discuss it. I think it might be done in chronic abscess when not too deeply seated, and might shorten the duration of the disease a good deal.

A CASE OF MASTOIDITIS; SINUS THROMBOSIS; PYAEMIA; TWO OPERATIONS; RECOVERY.*

By Thomas R. Pooley, M. D., *of New York, N. Y.*

Recovery in a case of marked pyaemia from any cause is certainly well worth reporting. It is this consideration, as well as many other interesting features, that has led me to report the following one.

The patient, Jennie Gallagher, a stout Irish girl of twenty-five, came to the clinic of the New Amsterdam Eye and Ear Hospital on March 7, 1903, with the following history: Five weeks ago her sister had died of puerperal septicaemia and she was in constant attendance upon her until she died. Two weeks ago she was taken ill with the grippe and three days thereafter developed some earache on the left side. The same night there was rupture of the membrana tympani and a free discharge took place. Upon admission to the Hospital there was a profuse discharge and a perforation in the anterior inferior quadrant of the membrana tympani, marked pain and tenderness with distinct redness and swelling. The swelling was confined to the mastoid region, did not extend upward and backward toward the site of exit of the mastoid vein, nor to the upper portion of the cervical triangle. The discharge showed abundant evidence of the presence of streptococci. The appearance of the patient was that of profound infection; temperature $101\frac{3}{5}^{\circ}$; pulse 120; respirations 30. Immediate operation was advised, at once consented to and

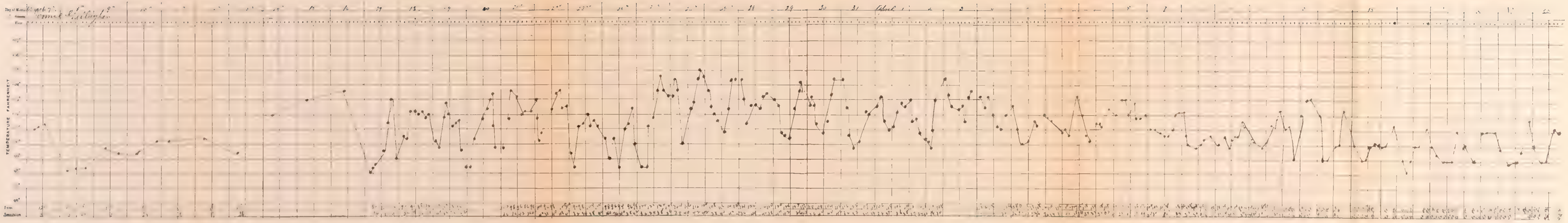
* Read by title

performed the same afternoon with the assistance of Drs. Claiborne, Barstow and Cook, and in the presence of many others. Ether was used as the anaesthetic.

The usual Schwartze's incision was made. The whole of the outer table was found to be softened, necrotic, and the cells filled with dark blood and granulations. The entire cortex was removed to the tip. Upon making an attempt to open the antrum with the rongeur, the sinus, the position of which was abnormally far forward and its wall extremely thin from caries, was accidentally opened, giving rise to a profuse hemorrhage. A tampon was quickly inserted and the hemorrhage promptly arrested. A posterior flap was now made to give better access to the sinus, when a small discolored point was seen upon the sigmoid roof. This necrotic opening was gradually enlarged by means of the curette and the rongeur exposing the descending portion of the sinus for nearly its entire length. All dead bone and granulations were removed. The plug was then removed from the sinus and a new one inserted. The antrum and mastoid were packed with iodoform gauze. The upper parts of the flap were brought together with silk and catgut sutures and a bandage was applied. The patient bore the operation well.

On the following day the temperature dropped to normal, the pain had ceased, and the entire condition was satisfactory. On the 10th the dressings were removed. There was no suppuration, the wound looked aseptic; the plug was removed from the sinus; no hemorrhage took place; temperature 100°; pulse 86; respirations 28.

The wound was dressed again on the 12th. The temperature had risen to $100\frac{2}{5}°$. On removing the gauze it was found that the wound was sloughy, the periosteum detached from the bone, and there was a profuse, offensive discharge from the wound. The exposed sinus was cleansed and the gauze reinserted.


TEMPERATURE FAHRENHEIT

pirations were very frequent. It was therefore determined to make another effort to get the blood to flow through the jugular. This was finally accomplished by still further curetting the jugular vein and by more or less forcible manipulations on the jugular vein and neck, by which means quite a quantity of blood streaked with pus escaped and then a free and copious hemorrhage took place. This method was resorted to with the full knowledge that it has been strongly condemned by excellent authority and because of my unwillingness to leave the obstruction and the assurance that the patient, who was almost moribund, could not survive any longer under the operation. The operation was now hastily terminated. No sutures were employed in the flap. The exposed dura was covered with iodoform gauze, both ends of the sinus were plugged with the same, and a bandage was applied. The operation was completed at about 6.30. The pulse was so rapid and feeble that it could hardly be felt at the wrist. Hypodermics of whiskey, ether and strychnine were given and a large high enema of salt solution. Hot-water bottles were applied to the surface of the body and friction made. Under this heroic treatment, after a number of injections, $\frac{1}{6}$ of a grain of strychnine in all having been given, she rallied, but the pulse was still very frequent, about 140, and hardly perceptible. The temperature by rectum was 103° and by the following morning it was $102\frac{1}{5}$°, with profuse perspiration. The next day the temperature ranged from $100\frac{3}{5}$ to 102°; pulse 90 to 102; respirations 38 to 42.

The patient was given whiskey and strychnine by hypodermic injection until evening, when she began to take whiskey by mouth. She had several loose stools and slept but little. There was no disturbance of the sensorium. She complained of pain in both arm and hip and had some nausea, but did not vomit.

On the 19th the wound was dressed. There was very little pus. Both plugs were removed; no hemorrhage followed. Temperature, pulse and respiration continued about the same. There was some stiffness and tenderness in the upper part of the cervical triangle, but no swelling and very little pain on pressure. She complained of pain in the right ankle, which on inspection was found to be red and swollen. Whiskey and liquid peptonoids were given.

On the 20th the temperature was still higher; pulse and respirations showed about the same variations. The patient took nourishment well. The ankle was still more painful, red and swollen. There was profuse perspiration. The patient slept a good deal and seemed stupid. There was involuntary passage of urine; the pulse was rapid but stronger. The wound discharged profusely.

On the 22d the patient complained of pain in the right shoulder, which was tender to the touch. The temperature ranged about the same, with profuse perspiration. The ankle was still more swollen; a bichloride dressing was applied. On the 23d she had a slight sensation of chilliness, but no distinct chill, perspiring freely.

On the 24th the temperature rose very high, reaching $104\frac{3}{5}^{\circ}$; pulse 131; respirations 52, and she complained of severe pain in the right side and back. On the 27th a careful examination of the lungs, made by Drs. Barstow and Bickerston, revealed the physical evidences of pneumonia over the right lung. A thick layer of antiphlogistin was applied over the entire area of the affected lung.

March 28th, highest temperature $103\frac{1}{5}^{\circ}$ at 6 P. M.; highest pulse 128; highest respirations 48. Pain in the back very severe. Perspiring very freely.

March 29th, highest temperature $100\frac{4}{5}^{\circ}$ at 11 P. M.; pulse 120; respirations 48. No cough nor expectoration.

April 1st: Wound is gradually healing. Sinus, antrum

and bulb gradually filling in. Dressed with balsam of peru.

April 2d, highest temperature $103\frac{3}{5}^{\circ}$; pulse 129; respirations 40. Restless, a little incoherent; perspiring freely; involuntary urination. Abscess in upper anterior part of arm opened. In dressing the wound, on removal of the gauze from the bulb, a smart hemorrhage occurred which was controlled only by tight packing.

April 6th, a very tender, indurated place over the left buttock; probable abscess forming. Applied antiphlogistin. Abscess on the arm continues to discharge freely.

From this time on abscesses formed in the buttock, two more on the arm below the first; both were opened, as was also the one on the nates. The wound had gradually closed in the sinus and that in the antrum had entirely healed. There is a large area of bare bone over the posterior part of the mastoid and the squamous portion of the temporal bone. The finger has healed with anchylosis of the joint, but the swelling of the ankle has entirely disappeared without any impairment of the joint. For the last two weeks the pulse and temperature have been nearly normal, the highest being 99 or 100° in the twenty-four hours.

The patient is still bedridden, very weak and unable to raise her head from the pillow. The wound at both ends of the sinus is closed. There is still some uncovered bone in the posterior part of the mastoid and squamous portion of the temporal bone. The patient may be said to be convalescent, but I reserve a full account of the case, with such remarks as I may wish to add for another time when the case has reached a final conclusion.

Since writing the above the condition of the patient has been one of slow and tedious recovery, with a very slight rise in the temperature in the afternoons, frequent

sweatings, gradual diminution of the quantity of pus discharged from the abscesses until they finally healed, great exhaustion, irritability, and indisposition to help herself, not even lifting her head from the pillow until after the 26th of April when the temperature continued about normal throughout the twenty-four hours, and she gradually began to recover some degree of strength and sit up in bed a short time.

On May 29th the exposed bone was found to be loose and a large sequestrum was removed, leaving perfectly healthy granulations underneath. The sequestrum, the

Sequestrum—Full Size. From a photograph by Dr. E. B. Coburn.

size and shape of which is represented in the accompanying photograph, consisted of a portion of the mastoid and squamous portion of the temporal bone, the upper and posterior border 3 cm. long, irregularly serrated for articulation into the parietal bone, the inferior border 3 cm. long, irregular from marks of the rongeur, the anterior border irregular and notched, 1½ cm. long, the posterior border 8 mm. long and slightly irregular, the whole varying in thickness from ½ to 2mm.; the inner surface irregularly concave and the external surface convex.

After removal of the sequestrum the healing progressed

much more rapidly. On June 11th the patient was discharged, still in a very weak and emaciated condition, having been in the hospital for a little more than three months. There was still a small area of wound unhealed, but the sinus and antrum wounds had entirely healed. The right middle finger was flexed upon the hand and the first phalangeal joint anchylosed. The temperature was normal, appetite good. There was gradual daily return of strength and only an obstinate constipation which had existed all through her sickness to contend with.

On June 27th I last saw the patient at her home, having been called to see her because she had suffered for the past two nights with headache and flashes of light before the left eye and a piece of bare bone in the lower part of the wound had been observed. I found that the appearance and general condition of the patient had very greatly improved. She had gained both in strength and weight and walked about all over the house without fatigue. She said, however, that for the last two or three nights she had been kept awake with headache, which extended from the wound to the temple and occiput and that there were flashes of light and obscuration of vision. The wound had healed except for a narrow groove of granulations immediately behind the auricle. In the lower part it was covered by thin, new-formed skin; a whitish point presented itself. Upon taking hold of this with a pair of forceps, a sequestrum was rapidly removed which was shaped somewhat like the letter "U," the longest branch being about 7 or 8 mm. long. Two minute spiculae of detached bone were also removed from the midst of the granulations. The pulse and temperature were normal. There was still obstinate constipation, which was only relieved by daily doses of a saline cathartic.

An examination of the eye with the opthalmoscope showed an almost complete restoration of the optic discs

to their normal appearance. There was only slight haziness of the disc margin and other small arteries. She could readily count fingers across both communicating apartments, a distance of about twenty feet, and read easily the finest newspaper print. In the absence of any rise of temperature or aggravation of the condition of the fundus oculi, I did not consider these symptoms of any great moment and the patient may fairly be said to be convalescent.

REMARKS.

This is the second case of pyaemia which has occurred in my practice following mastoiditis, both of which recovered. The other one, which has never been published, was observed in April, 1892, in a young man of twenty-one suffering from otitis media purulenta after scarlet fever. There was swelling and tenderness of the mastoid; infection had occurred when I saw him, with high temperature and chill. A mastoid operation was made and severe pyaemia ensued, involving many joints. There was septic pneumonia and choked discs and the characteristic temperature with alternate sweatings, and yet, after several months, the patient recovered. Whether or not there was thrombosis of the sinus is not stated in my record of the case.

Dr. J. B. Emerson reports "A Case of Pyaemia Following Acute Suppurative Otitis: Recovery" (Transactions of the American Otological Society, 1892, p. 221) in which no operation on the mastoid or sinus was performed. There was septic pneumonia. The treatment extended over a period of four months. A number of abcesses formed which were opened, no drugs being used except for the pain. The cause of the pyaemia is not given, but, as in my own case, was probably due to sinus thrombosis of which much less was known at that time.

It is worth while recalling the fact that my patient, while suffering from the ear disease took care of a sister who died of puerperal septicaemia, and to raise the question whether this exposure had anything to do with the severity of her attack. She was unquestionably septic when first seen and the examination of the pus showed streptococcus infection. Whether the pus absorption antedated the thrombosis is another point of great interest; that it did not exist at the first examination seems evident enough, although there was a necrosis of the antrum walls in removing which the sinus was exposed and opened, but the fact that there was a very large hemorrhage at that time showed there was no clot there. The symptoms of infection which were observed after the first operation were tonsillitis, anthritis of the finger-joint, chill and choked discs. It is most probable that the sequence of events was as follows: The sinus was infected at the time of the first operation. For the first three days thereafter improvement took place; then the sinus clot formed, with the subsequent appearance of the symptoms so characteristic of sinus trombosis.

Dr. Frederick Whiting in "A Contribution to the Symptomatology and Treatment of Pyaemic Sinus Thrombosis, Based Upon Three Successfully Operated Cases (Archives of Otology, Vol. 28, No. 1, 1898), says: In the event of failure to re-establish the circulation from below the jugular bulb, whether you have removed a purulent disintegrated clot or not, it is your imperative duty to your patient to tie the internal jugular forthwith as you otherwise leave wide open the main avenue to almost certain pulmonary metastases." And again, "Just at this point the writer desires to enter a vigorous protest against a procedure which has been occasionally witnessed upon the operating table, and himself participated in, when an attempt is made to force the return circulation from below upward through

the obstructed bulb by forcible manual pressure upon the muscles of the neck. I believe that all attempts at re-establishing the circulation by making pressure from below upward upon the muscles of the neck, in the hope of dislodging the clot, cannot be too severely condemned. It is a procedure in my opinion eminently calculated to favor the dissemination of obstructing infective material either directly through the jugular or collaterally through the tributary veins." I have quoted from the author verbatim, because this method, as I said in reporting my case, is the very one I resorted to, notwithstanding it had been strongly condemned by so excellent authority, and I venture to say that in the case before me it was fully justified and indeed the only thing to do. It was obvious to all who were present that the patient could not survive any further protracted operative interference, and to have left the obstructive clot in the vein would have greatly increased the hazard of the patient's recovery, while the manoeuvre was successful in re-establishing the return current through the jugular, and, although septic pneumonia did take place, the patient recovered nevertheless, and I contend that she was placed in a better condition for recovery by the fact that the return circulation was re-established. Without, therefore, saying that the procedure is always to be recommended, I am prepared to defend its adoption under similar conditions and to affirm that every rule may find exceptions and that no arbitrary one is applicable in all cases.

Another point of great interest to me was the somewhat difficult matter of determining whether the first symptoms of pus absorption were really due to sinus thrombosis. The tonsillitis was the very first symptom to cause pain and rise of temperature; then came the involvement of the finger-joint, which was so slight, and the swelling, redness and pain so closely resembled gout or rheumatism and the

co-existence of the tonsillitis made it more difficult to differentiate between this and arthritis due to pyaemia. This, however, was made easier when the temperature rose and the other symptoms, especially the choked discs, made their appearance. Septic pneumonia was the gravest symptom presented by the patient. Neither of the joint involvements went on to the formation of pus, and, although the peripheral abscesses were exhausting to the patient, they were nevertheless accessible to reach and surgical treatment. I may mention that besides being freely opened they were kept drained by gauze tents and thoroughly cleansed by antiseptic injections.

While speaking of local treatment, I wish to call attention to the use of antiphlogistin which was used as a dressing for the pneumonia, swollen joints, and indurations preceding the local metastases. In all of these it was most beneficial in allaying pain and especially so in the pain in the side caused by the pneumonia, the patient herself speaking loudly in praise of the remedy. Another method for the relief of the pain in the swollen ankle-joint of which I wish to speak is the suspension of the foot and leg, so as to take the weight off the joint and heel. This was done for several hours daily during the height of the joint involvement.

The neuro-retinitis at the last examination had subsided and the patient saw well, although no accurate examination of the acuteness of the vision was made. It may, therefore, go on record as one of recovery after intra-ocular involvement, in which cases, according to Kipp, the percentage of recoveries is about 50 per cent.

In conclusion it must be instructive to recall to mind the recovery of such cases whenever they occur for the encouragement of those who may feel that such conditions as were present in this one, both before and after the operations, were most discouraging, and the prognosis apparently hopeless.

THROMBUS OF THE SIGMOID SINUS. REPORT OF TWO CASES PRESENTING SOME SYMPTOMS DIFFERING FROM THOSE USUALLY FOUND IN THIS DISEASE.

By James F. McKernon, M. D., *New York.*

The otological literature of the past five years has contained reports of so many successful cases of sigmoid sinus thrombosis, that it may at first seem almost superfluous to bring this subject to your attention; but in the cases I am about to report some of the symptoms as found presented were a departure from those given us by many observers, and it is to speak of and emphasize these in particular that I wish to report these cases in detail.

Case I. Gave the following history:—L. C. a girl 16 years of age was admitted to my service at the hospital May 6th, 1902. Ten days before she had complained of pain in the right ear, with dizziness and buzzing on that side of the head. She had never had any previous ear trouble.

On admission, her temperature was 100.2 F., pulse 86, respirations 22. Physical examination disclosed on the right side a swollen and darkened drum membrane, bulging over the whole of the posterior quadrant, with a slight prolapse of the posterior, superior canal. There was slight tenderness upon pressure over the mastoid antrum, but none over the tip; there was no nausea or vomiting and only a slight headache.

An incision was made in the drum membrane, and this was followed by a discharge of thick pus, which was examined and found to contain streptococci in abundance, together with a few diplococci and pneumococci. The patient was placed in bed, fluid diet and free purgation for the bowels were ordered; and the ear was syringed every two hours with a 1-4000 solution of bichloride of mercury.

The following morning her temperature was 99 F., and she was feeling very comfortable; the middle ear was draining freely, and there was practically no tenderness over the mastoid. This comfortable condition remained for two days, and was then followed by severe pain in the ear and in the mastoid of the same side.

Tenderness upon pressure over the mastoid antrum was increased, and there was also a further prolapse of the posterior superior canal wall. The temperature was still 99 F.

Owing to the increased pain, tenderness and prolapse of the canal walls, it was decided to open the mastoid; the typical mastoid operation was done, the antrum and cells were found filled with greenish pus, which, upon examination, was found to contain large numbers of the streptococci. The sinus was not exposed, and the patient was returned to the ward in good condition.

The following morning she was very comfortable, the temperature was 98.8 F., pulse 78 and respiration 20. At 3 P. M. of the same day the patient asked to have a window some distance from her bed closed, saying she felt a little cold; her temperature was at once taken. Although it had been recorded but two hours previously as 99 F. it was now found to be 105.6 F., pulse 146 and respirations 28. In about an hour she complained of nausea, but there was no vomiting.

She still complained of feeling cold but no chill was

present. A special nurse was detailed to care for the case, with instructions to take the temperature every two hours and watch carefully for any evidence of a chill. For the next twenty-four hours, the temperature, taken every two hours, registered at no time higher than 105.8 F., its lowest point being 105.2 F. The chilly sensation continued and the girl became dull and sleepy; the eyes were examined and found to be negative.

This condition continued throughout the afternoon and night.

The next morning her unchanged condition and continued chilly sensation made me suspect sinus involvement; and at noon of that day she was again taken to the operating room, and the sinus exposed from an inch above the knee to the bulb. The dura covering the sinus was almost black in color, and the sinus wall between the knee and the bulb was collapsed. The anterior wall of the sinus was incised at the knee with a scalpel for half an inch, and a small amount of straw colored serum escaped; a curette was passed upward and a clot about half an inch in length was removed. This clot was firmly adherent to the anterior and inferior wall of the sinus, and was of a yellowish brown color.

Upon its removal, a free hemorrhage followed from the torcular end of the sinus, which was controlled with iodoform packing. Continuing the incision in the sinus wall downward to the bulb, a portion of the lumen of the vessel was found empty for nearly an inch. Below this point, pus, with a reddish grumous material was found; this was removed and the curette used freely at the bulb.

Upon wiping away the debris each time after using the curette, a few drops of grayish pus would make their appearance, coming apparently through the bulb from the internal jugular vein. Owing to this condition being present, and to the fact that there was no return hemorr-

hage from either the vein or petrosal sinuses, it was decided to expose, ligate, and resect the internal jugular vein, so as to prevent the possibility of any further systemic infection taking place through the vein on that side. This was done, as was also a portion of the internal maxillary and facial veins, ligated and resected, as, upon exposure, they were found to be involved. There were also four infected glands removed during the course of the dissection.

The ligature used on the jugular vein was heavy silk, and on the tributaries, chromosized gut. The field of operation was cleansed with a hot saline solution, and a continuous silk suture used to close the wound in the neck.

Immediately following the operation, a quart of hot saline solution was introduced into the bowels, and this was all that was necessary in the way of stimulation.

For the next two days, the temperature did not drop below 104° F. and the lowest pulse rate was 144. There was considerable twitching of the right side of the face and mouth, and she was exceedingly restless, but perfectly conscious, complaining only of pain in the head and wound.

On the third day following the operation, the temperature dropped to 102.6° F., pulse 128, and there was less head pain.

For the next six days, making nine days from the time of operation, there was a gradual improvement in her general condition, with a slight lowering of the temperature each day, until on the tenth day, it reached normal, where it remained.

The neck wound healed by primary union, and the girl was discharged from the ward service three weeks after the operation, to return every third day for dressing until the mastoid wound was closed. The resected jugular, as

well as that portion of the tributaries removed, were sent to the laboratory for examination, and the pathologist reported the finding of a broken down clot with pus present. Large numbers of streptococci were present in the material found in the veins. The glands removed also contained the same characteristic infection.

Case II. E. L., a girl 6 years of age, was first seen on June 2d, 1902. The history given by her mother was that she had been taken ill six days previously with pain in the right ear, followed in twenty-four hours by a bloody discharge, this discharge lasting three days.

The child had never had any ear trouble before, and otherwise had always been in good health.

Upon inspecting the ears, a scanty purulent discharge was found in the external auditory meatus of the right side; the canal walls were inflamed, and there was a large ragged perforation in the lower anterior portion of the drum membrane over the tympanic orifice of the Eustachian tube. There was no sagging of the canal wall, and only a slight amount of tenderness on pressure over the mastoid antrum. A culture was taken from the discharge found in the canal, and contained large numbers of streptococci. There were also a few diplococci and staphylococci present.

The temperature was 99.2° F., pulse 94. The child was placed in bed, and the canal irrigated with a solution of bichloride, $\frac{1}{6000}$ every two hours.

The little patient slept some at intervals during the night, but complained toward morning of not having sufficient covering over her. When seen the day after her admission, the temperature was 99.6° F., pulse 100. At intervals during the day she complained of feeling cold.

The bowels were moved freely, and she was kept on a fluid diet, and the temperature taken every three hours.

The discharge from the canal increased somewhat, but the mastoid tenderness remained about the same. The child continued practically in this condition for five days, the temperature never rising above 99.8° F., and she complained each day of feeling cold. On the sixth day there was a tendency to sagging of the posterior superior canal wall, and the discharge had diminished considerably. The tenderness over the mastoid was about the same as the days previous, but the child was beginning to look septic, and the breath was very offensive. The tongue was dry, heavily coated, and of a dark grayish color.

Believing we had a condition, the cardinal symptoms of which, for some unknown cause, were masked, an operation was decided upon. The usual mastoid operation was done, there was only a small amount of pus found in the antrum and at the tip, but the whole osseous structure was infiltrated and softened, and nearly all the inner table was removed. The sinus was very close to the posterior canal wall, and was exposed below the knee; the dura covering it was distinctly greenish in color, and seemed more prominent than one usually found in a patient as young as this one. A further exposure was made both above and below the knee, and at these points, the dura was greenish in color also. The anterior sinus wall at the knee was opened with a scalpel for about half an inch, and immediately about a teaspoonful of thick, grumous material began to ooze through the slit made in the wall; it was of a reddish brown color, of about the consistency of thick cream, and incorporated with it were particles of pus.

A dull curette was used above, and more of the same material removed and free hemorrhage established. The lower portion of the sinus toward the bulb was now curetted, and after the removal of some more of this reddish brown material, the character of the substance began

to change, and assume more nearly the character of dark colored pus.

The bulb was now curetted without any flow of blood taking place. The sides of the sinus wall were separated, and the lumen of the vessel in the region of the bulb was wiped clear of pus and debris, and when this was done the same dark colored pus was seen coming up through the bulb.

Believing we had here to deal with an infected vein as well as a sinus, the neck was prepared, and the internal jugular vein was exposed, ligated below at the clavicle and above at the bulb, and resected.

The tributaries did not show any evidence of infection so they were ligated and left in position. Neither was there any glandular involvement. The wound was closed by a continuous suture to within an inch of the bulb, and healed by primary union throughout. The resected vein for $2\frac{1}{2}$ inches below the bulb contained a soft substance easily compressible by the finger.

The lower portion of the vein to its point of ligation beneath the clavicle was collapsed. The resected portion was sent to the pathologist for examination, who reported as follows:—

"In the case of L. E. I beg leave to say that the internal jugular vein was thrombosed for a little over 2 inches, the clot was formed from pus and broken down blood and cellular elements. There were a large number of streptococci present, there were also found a few diplococci and pneumococci."

The usual dressing was applied, and the patient was returned to bed without having had recourse to stimulation during the operation.

Three hours after her return to bed, she had a chill, and the temperature rose to 106.3 F., with pulse 166 and respirations 54. In an hour the temperature had dropped one degree, but the pulse was 174 and very weak.

Transfusion with a normal salt solution was now done through the median basilic vein, and oxygen administered every few minutes.

Under this stimulation her pulse improved, and the temperature at the end of twenty-four hours had dropped to 101.4 F.

From this time until the date of her discharge, four weeks later, there was no complication, although her temperature did not reach normal and remain there until nine days after the operation.

That there are a few points of extreme interest in the onset and development of these two cases, which will bear dwelling upon for a few moments, I think all will admit.

First—We have here as the cause of the mastoid and sinus involvement an acute inflammation of the middle ear in both. While this is by no means a rarity, still it is an unusual condition following so rapidly upon an acute otitis.

Second—The predominating infection in both cases was due to a streptococcus poisoning; and, it is believed, it was largely due to this that the rapid involvement of the osseous structure was caused. It was also, on account of this infection, that no other abortive measures were used to cut short the disease, when the cases first came under observation, for, in a large percentage of cases observed during the past six years, it has been found that where this infection predominates, abortive treatment is of little or no use. In fact, it only masks or retards their development, and much valuable time is lost.

In a report given me by the late house surgeon of the New York Eye and Ear Infirmary, of all cases presenting themselves at this institution since 1897 with this characteristic infection, no matter what the abortive treatment had been, four-fifths went on to operation. So that, given

a case of acute purulent middle ear discharge, with incipient mastoiditis, if the infection predominating be that of the streptococcus, no matter what abortive measures are used, the majority of cases reach the operative stage.

Third—In both cases, there was no chill, only the sensation of feeling cold; and in a paper on this subject, presented to the American Otological Society four years ago, I called attention to this fact, and at that time stated that we were not justified in waiting for more definite symptoms than this chilly sensation complained of by these patients. That is—given the other symptoms usually present in these cases, with the patient complaining of feeling cold, we should not wait for a decided chill before operating, for in many of the cases I have observed, a chill has not been present during the entire development of this disease.

Fourth—In the first case here reported, we have a continuously high temperature, never falling below 105.2° F., which, if we follow the typical temperature chart of an ordinary sinus case, is unusual; for we expect a rapid rise, and either a sudden or gradual remission, and oftentimes look for this to be repeated before we decide upon a further investigation as to its cause. In the second case, the temperature differs markedly from that of the first, and, in fact, from the majority of sinus cases, for at no time during the six days that the case was under observation, did the temperature register higher than 99.8° F., and in this case, had one been guided to any extent by the temperature, he would hardly have deemed it necessary to operate upon the case at that time.

THE EFFECTS OF INCREASED INTRA-TYMPANIC PRESSURE. A POSSIBLE EXPLANATION OF TINNITUS AURIUM.

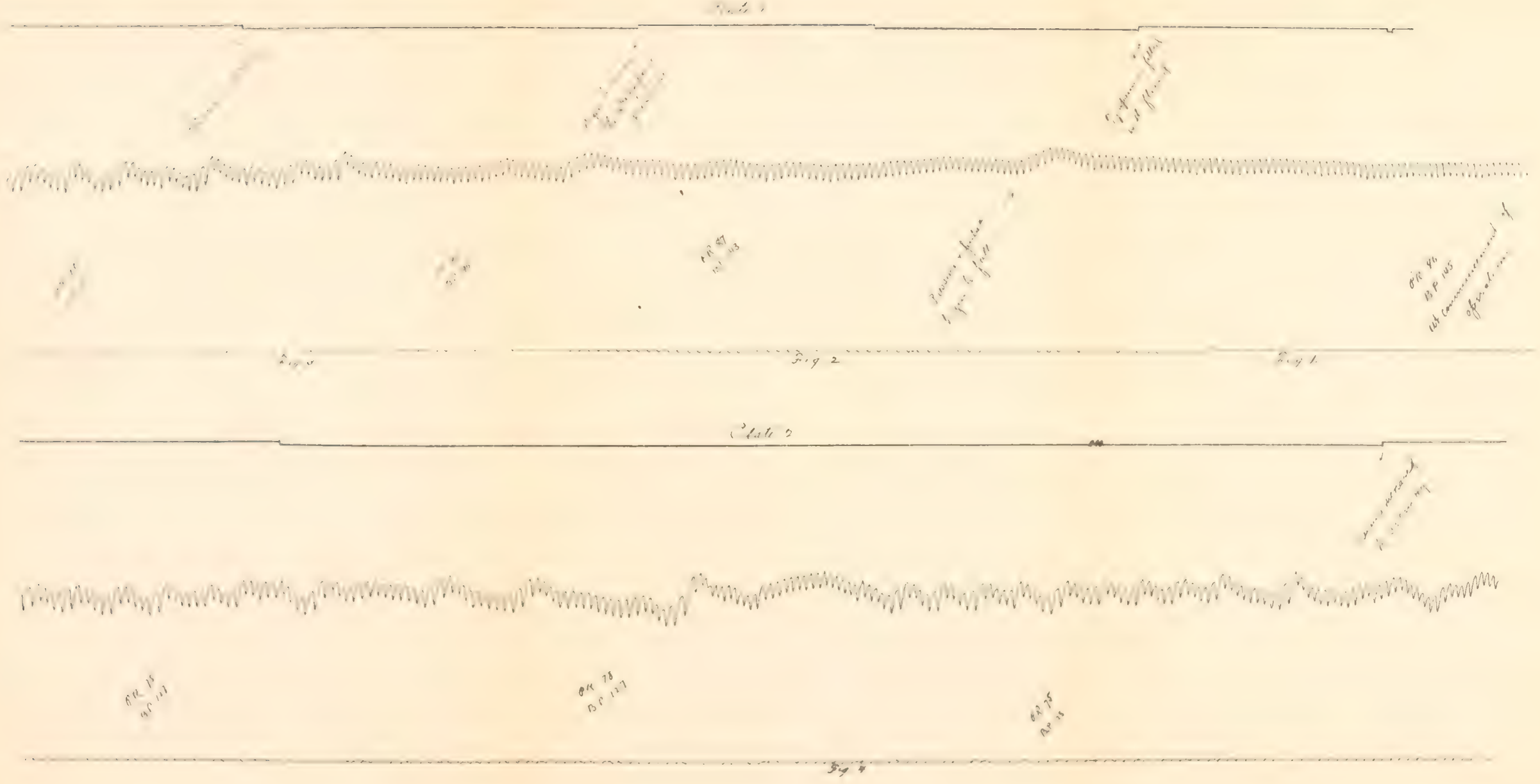
By H. O. Reik, M. D. *Baltimore, Md.*

At the last annual meeting of this society I had the privilege of presenting for your consideration some physiological experiments showing the cardiac and vascular effects of operations on the middle ear. You will remember that these experiments tended to show that operations upon the membrane or ossicles always produced a depressor effect, which was an unusual result to follow stimulation of a sensory nerve, and that the lowering of blood pressure was in direct proportion to the amount of injury as was, also, the duration of the period of depression. This fall of blood pressure immediately following an injury to the tympanum was shown to be due to disturbance of the vaso-motor apparatus and to account in a satisfactory way for the cardiac depression and syncopy that so often accompany operations upon the middle ear, phenomena that had been erroneously attributed to disturbed equilibrium due to increased intra-labyrinthine pressure. During the past year I have attempted to carry these experiments somewhat further, and, while they are not at present as complete as I had hoped to have them, I offer a brief report of what has been done.

The next step in advance of what I had done seemed to be the determination of the effect of increased intra-tympanic pressure as measured by changes in the pulse rate and blood pressure. As in the former instance dogs

were used for the experiments and careful records were taken with the aid of the kymographion. To secure a measured pressure resembling as nearly as possible the abnormal pressure that might occur in disease, the animal was anesthetized and water was injected through the Eustachian tube into the tympanum without the production of any traumatism. This was accomplished by introducing a silver catheter into the mouth of the Eustachian tube and holding it securely in place so that no leakage could occur, the water being allowed to flow by gravity from an irrigation bottle, containing 1,000 ccm., suspended from the ceiling by cord and pulleys. Soft rubber tubing connected the catheter with the bottle, and a branch of the tube (secured by the insertion of a glass T-shaped piece near its center) was attached to a mercury manometer placed on a level with the animal's ear to record accurately the amount of pressure being exerted within the tympanum at any given moment. The degree of pressure was varied by simply raising or lowering the reservoir. The greatest difficulty encountered consisted in locating the dog's Eustachian orifice, which is well protected by the soft palate and can only be reached by splitting and drawing aside that membrane.

Before injecting the fluid the kymographion was started, and the blood pressure found to be 145 mmHg while the pulse rate was 96 per minute. (Fig. 1). Withdrawing the anesthetic, the tympanum was filled with fluid without any further pressure than would necessarily attend the weight of that small quantity of water, and the pressure and pulse again noted. Figure 2 will show that the pressure at once fell to 143mmHg and the pulse to 87 per minute. Suddenly raising the reservoir to a point where the manometer recorded an intra-tympanic pressure of 29 cmHg, a change of about 5cm., a marked fall of blood pressure was noted and coincident with this a change in



the character of the pulse; the pressure gradually fell to 138mmHg and the pulse rate to 78. (Fig. 3). As long as the intra-tympanic pressure was maintained at this point the blood pressure and pulse rate remained about at the same level, but as soon as the reservoir was elevated to a greater height a further depressor effect was obtained, that is, with the manometer showing a pressure of 33 cmHg, the highest point we could reach in the room where we were working and with the apparatus employed, the blood pressure dropped to 127mmHg and the pulse rate to 75. (Fig. 4).

In 1882 Baginsky published an interesting little monograph, entitled "The Results of Increased Intra-tympanic Pressure and the Function of the Semicircular Canals," an abstract and critical review of which was given in the American Journal of Otology by our lamented friend the late Dr. Vermyne. Baginsky approached the problem of tympanic pressure in a different way, and while most of his work was certainly carefully performed some of it was subject to grave error, and unwarranted conclusions were consequently drawn.

In the first place, he produced increase of pressure in the tympanum by injecting fluids through a perforated tympanic membrane with a syringe the conical nozzle of which had been hemetically sealed into the meatus. No attempt was made to close the Eustachian tube and he had no means of ascertaining the amount of pressure employed. Neither had he any accurate means of determining the effect of such pressure, depending as he did upon noting the clinical symptons. His post-mortem examinations showed that in almost every instance sufficient force had been used to rupture the membrane of the round window and to set up considerable cerebral disturbance. This accounts for the severe clinical symptoms described, but the experiments in no sense represented or simulated

conditions that might occur to an ear in the ordinary course of events. He did succeed in demonstrating the graver results of very high pressure, results that could be measured by observation of the animal's action, but he could not estimate the slighter effects of small degrees of pressure, such as might attend a pathological exudate in the middle ear. It was but natural that his methods of work should have led him to the conclusion that increased intra-tympanic pressure produced no effect until it had reached a sufficient degree of force to cause rupture of the fenestral coverings and consequent injury to the brain. That this was a mistake is shown by the report I have just made.

The practical application of these conclusions concerning intra-tympanic pressure is a matter of some importance and I should like to consider for a few moments their possible bearing upon the causation of tinnitus aurium. I am not convinced that the generally accepted theory of increased intra-labyrinthine pressure explains the etiology of tinnitus in the majority of cases. It may well be the proper explanation of some, for it seems reasonable to suppose that tinnitus would be one of the disagreeable features of such changed conditions in the internal ear; but there is no reason to assume that in the majority of cases of tinnitus an increased pressure in the labyrinth exists, hence, the alleged explanation is not applicable. There can be a considerable amount of exudate poured out upon the mucous surface of the tympanic membrane or into the tympanum, quite a sufficient quantity to produce a disturbance of the vaso-motor equilibrium, without any evidence of pressure upon the stapes or the round window. It is not necessary that the tympanum should be filled with exudate in order to produce a rise of intra tympanic pressure, and a vaso-dilator effect. The presence of any exudate in the tympanum can

be accounted for only by supposing the previous existence of inflammation and, as swelling of the tissues is a constant accompaniment of inflammation, it is reasonable to presume that this swelling may, of itself, cause sufficient irritation of the vaso-motor nerves to bring about some depression. This irritation is not sudden or violent and a reaction is consequently moderate in degree.

It was long ago suggested that tinnitus aurium might be due to appreciation of sounds produced by the circulation of the blood in the vessels in or bordering upon the tympanum. This theory has heretofore been offered purely as an hypothesis, and I call your attention to it now to suggest that this experimental evidence may support its correctness. The authorship of this idea that tinnitus constitutes an appreciation of sounds attending the circulation belongs, I believe, to Dr. Theobald, who in an excellent arcticle on "Tinnitus Aurium"[1] says: "Certain subjective sounds, exceptional in character, of a pulsating, or of a blowing or hissing nature, comprehended under the name entotic, have long been regarded as vascular sounds, having their origin in the larger vessels which run in the neighborhood of the temporal bone. Clinical observation however, led me to infer the much more frequent existence of an intimate association between the subjective sounds which accompany aural diseases, and the phenomena attending the circulation of the blood. Induced by the result of these observations to examine further into the nature of this connection, I have, * * * been led to the conclusion, that, in almost all cases tinnitus aurium * * * is to be attributed to the existence of *vibrations excited in the walls of the blood vessels of the labyrinth by the friction attending the circulation of the blood*, which are capable of imparting to the labyrinthine fluid, and thence to

[1]Trans. Med. & Chir. Fac. of Maryland, Vol. 2, page 192.

the terminal filiaments of the auditory nerve, impulses similar in character to those which are produced by the vibration of the stapes, and hence, like them, capable of giving rise to the sensation of sound.

"The possibility of sonorous vibrations being thus excited cannot be doubted. Not only is it in accordance with the laws of acoustics, but a number of familiar instances of this phenomenon actually occurring in the human system may be cited. Aneurismal and anaemic murmurs, the *bruit de souffle*, and certain cardiac sounds, are examples. It may be urged that in all these instances the blood vessels are infinitely larger than those of the internal ear, and the mechanical forces concerned proportionately greater; and, therefore, that I am not warranted in assuming that since, under such circumstances, vibrations capable of exciting sensible sonorous undulations are produced, therefore vibrations competent to produce a like effect could be generated in the relatively small vessels of the labyrinth. In reply to this it may be said that, though the amplitude of such vibrations would be infinitely small as compared with the amplitude of those of the larger vessels, still, owing to their peculiar relation to the auditory nerve, the impression which they would make upon it might be many times greater."

Regarding the generally accepted theory, Dr. Theobald in the same article, says: "Since, however, we have no reason to suppose that the slight increase of tension which could result from the widest incursion of which the stapes is capable—for it is to this that the increase is usually attributed—and which, as a result of aural disease would necessarily be slowly superinduced, would be competent, *through compression of the nerve elements*, to produce so sensible an effect; and, since, moreover, we are led by analogy to infer that the sensibility of the nerve would not be so excited, no such effect being produced by

compression of the retinal elements in glaucomatous conditions of the eye; it seems more reasonable to attribute the tinnitus which is known to occur under such circumstances to the accompanying vascular disturbances, rather than to regard it as an expression of an irritation of the nerve the immediate result of compression."

To substantiate Dr. Theobald's theory it was necessary to show positively that changes in the calibre of the blood vessels of the tympanum or labyrinth occurred as the result of irritation within the middle ear. Of this I think there can be no doubt. Any irritation of the tympanic membrane or of the mucous membrane of the tympanum will produce vaso-motor changes both within the middle ear and the labyrinth, since the blood supply of both regions is not only intimately associated, by anastomosis, but controlled by the same nerves.

REPORT OF A CASE OF DOUBLE ACUTE MASTOIDITIS FOLLOWED BY SINUS THROMBOSIS AND OTHER COMPLICATIONS—OPERATION—RECOVERY.

By Gorham Bacon, M. D., *New York, N. Y.*

The patient, Clara K., married, twenty-four years old, born in this county, was admitted to the New York Eye and Ear Infirmary on April 2, 1901. She gave the following history: One week ago, following an attack of grippe, she had a violent ear-ache (left side). The pain with considerable tinnitus continued for two days and then the right ear began to ache even more severely than the left one. On the following day, (four days ago) the right ear began to discharge and the pain was much relieved. Three days ago a discharge appeared in the left ear, and at the present time there is a free purulent secretion from each canal. For the past three days she has been very deaf and has suffered from vertigo, which has steadily been growing worse. Night before last she vomited nearly all night and the following day. She says that she has not had any fever or chills. She has slight facial paralysis on the right side.

When examined, although the discharge was quite profuse, there was a distinct bulging of both drumheads, especially in the upper posterior quadrants. There was great tenderness when pressure was made over the mastoid processes. The tenderness, however, was more marked on the right side than on the left. Temperature 99½° F., pulse 102. She consented to an immediate operation.

Operation. April 2d. Owing to the fact that she expected to be confined in about six weeks, it was deemed advisable to perform the operation as quickly as possible. Under ether, the usual incision was made behind the right auricle and the outer cortex was removed, exposing the cells from the antrum to the tip. The entire process was filled with a reddish-tinged pus, which, under microscopical examination showed virulent streptococcus infection. There seemed to be an acute caries of the cells. A portion of the posterior canal wall was somewhat softened and was removed. The dura was not exposed.

An incision was then made over the left mastoid process, and the condition of affairs was very similar to that found on the right side, except that the disease was not so destructive on this side. The entire cellular structure was removed. No streptococci, however, were found in the pus from the left mastoid.

The wounds were thoroughly irrigated and dressed in the usual way. The patient showed steady improvement until April 5th, when the temperature rose gradually to $104\frac{3}{5}^{\circ}$ F., pulse 130. The wounds were dressed, and the temperature fell slowly until it reached 99° F. at 9 A. M. on April 6th. An hour later, the patient had a violent chill lasting fifteen minutes, when the temperature rose to 106.5° F. (rectal), followed by profuse perspiration. She was nauseated and vomited during the morning,—pulse 130. She had also vomited during the previous night. There was absolutely no tenderness on either side of the neck, along the course of the internal jugular veins. There were no anaesthetic areas. Cerebration good. No eye symptoms.

It was decided to open immediately the sigmoid sinus on the right side owing to the fact that there had been more softening on this side due to the virulent streptococcus infection. The original incision was extended with a perpendicular incision carried towards the occiput. The

softening of the bone had extended considerably. The dura over the antrum was exposed as well as that covering the sigmoid sinus. The sinus was then laid bare from above the knee where the walls of the sinus were normal in appearance to a point very near the bulb. The sinus was firm, and on opening it with a bistoury a large clot was removed. A curette was introduced upwards and the current of blood re-established in this direction. The curette was then passed downwards to the bulb and all clots removed. From this end, however, the blood did not flow. The wound was dressed in the usual way and the patient left the operating table in excellent condition. The clot was examined microscopically and found to contain pus cells and streptococci. Three quarters of an hour later the patient had a chill, followed by a temperature of 105° F. and profuse perspiration. The temperature gradually fell to 101° F. at midnight. On April 7th the temperature was $99\frac{1}{2}$° F. in the morning and $101\frac{2}{5}$° F. in the evening. On April 10th the temperature was normal and remained so until April 20th.

On April 15th at 10.45 A. M. an eighth month child (girl) was born after only thirteen hours of labor. The mother was a primipara. All went well until April 20th when the patient had a temperature of 103°. Dr. S. Lambert of the Maternity Hospital kindly saw the patient and made an examination, but found nothing in the uterine condition to cause the temperature. The patient had complained for several days of tenderness in the right gluteal region. There was at this time considerable induration. On making a deep incision through the soft parts an abscess was found. About eight ounces of pus were evacuated. The pus contained staphylococci. The condition of the patient was satisfactory for several days when the temperature again rose. A similar condition of affairs was found in the left gluteal region. Pus was evacu-

ated from this side. There were no further complications and the mother and child left the Infirmary in excellent condition on May 27th. The wounds had healed and the hearing was good.

I wish to call your attention to several points in the history of this case, which seem to me to be of interest. In the first place, the patient's condition was such that it was feared that labor pains might begin at any moment. In view of this fact, the operative procedures were performed as rapidly as possible. When the patient showed symptoms of sinus thrombosis, the question naturally arose as to whether one or both sigmoid sinuses were involved. Owing to the fact that the streptococcus was found only on the right side, it seemed best to open that side and await developments. When the patient had a chill shortly after the operation, it seemed fair to ascribe the elevation of temperature to involvement of the left sigmoid sinus or to a thrombosis of the right internal jugular vein or of both veins. It seemed possible, however, that absorption which had already taken place, might be the cause of the second chill and that it was wiser under the circumstances to wait twenty-four hours. Such proved to be the fact, for the temperature showed some variations for three days and then became normal.

Another point to which I wish to refer is that in recent cases of sinus thrombosis in which, after removing the thrombus, the current of blood has not been re-established from the bulbar end, it is not wise to ligate immediately the internal jugular vein. Especially is this true when the thrombus has not broken down and when there is no tenderness on pressure along the vein in the neck. In such cases I have made it a rule to wait for twenty-four hours, and as a result, for a number of years I have not been obliged to ligate the internal jugular vein.

For the successful result in this case, I am greatly in-

debted to the skill and excellent judgment shown by the House Surgeon, Dr. J. D. Richards.

DISCUSSION.

Dr. Randall :—I think this is a subject which deserves very careful consideration, and one that will present a good many surprises for some time to come. I think we can forego the ligating of the jugular in a good many of these cases, but I believe as he does, that it is a huge safeguard to lay bare the vessel and see if it appears to be broken down, and that this is especially helpful in some of the more puzzling and indefinite cases.

A few weeks ago I had a case where the child had little temperature and no rigors. The only thing which I could make out was that there had been suppuration of the middle ear, which had been improved, but not controlled. The child had shown some intra-cranial irritation, but was somewhat neurotic. When the child came in the temperature reached 104, and during the operation it went up to 105 or more. There was cholosteatoma and phosphatic pus found in the mastoid. I found the inner wall of the mastoid intact, but I laid bare a small area of the lateral sinus, which seemed healthy. The glands along the jugular were enlarged, but there was no considerable inflammation under the muscles of the neck. Two days later when I went in to ligate the jugular it was hugely altered, and a thrombosis clear to the innominate was past help. The main trouble was downward from the bulb, and the case was manifestly a grave one—how grave I did not appreciate, until upon leaving the table the child was brought back pulseless.

The mere ligation of the jugular when in doubt is a matter so simple, it seems to me that we ought to undertake it; and statistics point to a less mortality with ligation than without.

In regard to cleaning out the bulb of the jugular, we had a good paper from Dr. Gruening last year at New London, and nothing perhaps can be better said in regard to this question, yet it does add materially to the time and dangers of the operation; but I have found that a little curette based upon the general form of this which I present will reach back and enable us to clean out the lateral sinus backward and forward, cleaning out the jugular bulb from above. It does not take the place of removal of the bone when dead, but it has thus far very well served my purpose.

Dr. Jack:—The surgical treatment of sinus thrombosis is very important. I should like to put myself on record as advocating ligature of the internal jugular in all cases which are or may become septic.

Dr. Woods:—I should like to ask Dr. Bacon and those with more experience in these things than I have had, about ligation of the lateral branches of the jugular. I reported to this society three years ago the case of a boy who died of metastatic abscesses from general streptococcus infection following sinus thrombosis. At operation good currents were established in both directions after removal of the thrombus. All went well, without significant variation of temperature, for a week or so, when there was complaint of pain in the neck. We found an abscess anterior to the jugular canal, the vein itself being reduced to a mere cord. Even had the condition of the boy at operation justified further operative procedure after removal of the thrombus—which it did not—I question if ligation of what remained of the vein would have done good. The return currents from below evidently came from the high branches, and infection, it seems to me, was away from the jugular itself.

Dr. Sprague:—I remember a case I operated on a few years ago where I removed a thrombus from the sinus, and the child died a week or so after, and I thought perhaps I

had not done my duty in not ligating the jugular, so after the child's death, although the parents would not permit an autopsy, I had an opportunity to open up the neck. I found the jugular was entirely collapsed, and entirely empty, so I concluded that I had not done wrong because I had not ligated. Just what caused the death of the child I do not know.

Dr. Crockett :—It has always seemed to me advisable to ligate the jugular, although statistics are not very strong in favor of it. It is very easily done, and infection is cut off from other parts of the body thereby. Many cases get well without cleaning out above. It seems to me there may be infection in the lung without any infection that can be demonstrated microscopically. It is proved that infection to other parts of the body may follow thrombosis.

Dr. Randall :—I would like to ask Dr. Crockett if the statistics are not about equal in favor of ligating the jugular. As far as I can find out they are.

Dr. Crockett :—In answering Dr. Randall as to whether the statistics in favor of ligating the jugular are not about equal, I will say, that if I remember rightly there is a very great difference in statistics. I think it was 60 one way and 40 the other way. It has been my experience to ligate in all cases rather than wait and be too late. I remember a case where I opened the lateral sinus, and then decided to wait, when really there was no reason why I should not have done it at that time. I did not do it for two days. That man had gangrene of both legs, and it was a very distressing case. I was sorry I did not ligate earlier.

CHRONIC SUPPURATIVE OTITIS MEDIA, THROMBOSIS OF THE SIGMOID SINUS AND INTERNAL JUGULAR. OPERATION ON MASTOID AND SINUS WITH LIGATION OF THE DEEP JUGULAR, FOLLOWED BY SEPTIC PULMONARY COMPLICATIONS, AND DEATH SIXTY-FIVE DAYS AFTER OPERATION.

By Frank Buller, M. D., *Montreal, Canada.*

I desire to place this case on record as showing the necessity for very early operative interference, whenever in the course of chronic suppurative otitis media there is reasonable evidence that septic conditions are likely to extend beyond the immediate osseous surroundings of tympanum and mastoid.

Although the case was not completed by a post mortem record, there is nothing much to regret on this account, since the clinical history shows plainly enough just what happened and how it all came about. There are some unusual and many interesting features in this case, which are really worthy of more than a passing notice. I do not, however, ask your attention to a tedious case record, when a brief synopsis will serve our purpose just as well. The details can be given more minutely in print, if your Publishing Committee sees fit to have them put in that form.

The subject of this communication A. S. was a small, and rather frail young woman, aged 22 years, from whose left ear I had removed a large polyp some six or eight years previously. Subsequent treatment arrested discharge to such an extent that the patient considered her-

self well, and discontinued treatment; consequently I saw no more of her until the 30th of last September. I was then called in consultation with the family physician on account of certain symptoms which had commenced on the evening of Sept. 19th. A few days previously she had been laid up for a short time with an attack of influenza, or perhaps an ordinary cold; when nearly recovered from this attack, she took an outing in the street cars, and suffered from the cold evening air. This was credited with bringing on immediately a severe pain in the ear in the left side of the head. The pain ceased the following day, with the occurrence of discharge from the ear after certain hot applications had been made. Two or three days later the discharge ceased, and about this time she had a rigor and complained of pain in the top of the head. After this there were daily rigors and high temperature up to the time I first saw her, on the evening of Sept. 30th. She had also vomitted several times. At this time the local conditions were slight tenderness over the mastoid and more pronounced towards the apex, an unmistakable swelling beneath the St. Cl. mastoid for a short distance down the neck, a little foetid secretion in the auditory canal, a perforated in-drawn drum membrane, which was extensively destroyed in the posterior half. In this situation there were some small moist granulations. This moisture was also extremely offensive. The patient appeared rather apathetic, but answered all questions intelligently, and complained of pain in the top of the head. The ophthalmoscope showed a commencing double neuroretinitis with well marked hyperaemia and blurring of the optic nerves. The following day the swelling in the neck and the ophthalmoscopic changes were rather more pronounced, and there had been two more rigors, with great temporary increase of temperature. The diagnosis was sinus thrombosis. She was removed to the hospital and

prepared for operation on Oct. 2nd. It was decided first to tie the deep jugular, the vein was found pale, collapsed and containing a small thrombus when divided between the ligatures at a point about half way down the neck. This part of the operation was done by Dr. Garrow, of the Royal Victoria Hospital. After the wound had been hermetically sealed I proceeded to open the mastoid, which was somewhat sclerosed, but at the depth of about half an inch softer bone was reached, infiltrated with foetid pus and partly carious. Following this softened area it was found to lead directly into the knee of the sinus; further in towards the tympanum the bone was less diseased. I exposed the sinus quite freely, and on opening it found the cavity filled with foetid partly disintegrated clot. All this was removed, first downwards, and the sigmoid sinus cleaned with formalin solution; then backwards along the lateral sinus until blood flowed copiously. This was promptly arrested by firmly packing the whole cavity with moist iodoform gauze.

The patient recovered satisfactorily from the operation, but on the following day again had a chill; the chills recurred once or twice daily during the four following days. On the 6th of October the dressing was changed, and all the gauze packing removed from the lower part of the cavity. It was not altogether free from odor. On this day some cough was noted for the first time, and dullness was discovered at the base of the right lung.

I may say that up to this time there were no evidences of pulmonary, cardiac or renal complications. The cough was quite troublesome during the following night, and on the 7th a friction sound was audible at the right base. The aspiration needle was used, but no fluid discovered. On the 12th gauze all removed from the lateral sinus and the whole cavity found fairly healthy. On the 15th a considerable abscess had formed at the point of ligation, and was evacuated. The pus was thick, yellow and foeted.

From this time the patient's condition showed considerable improvement. She appeared to feel better and was quite cheerful. All of a sudden, at 3.30 P. M. on Oct. 23d, spasms of the right arm and hand occurred: there was spasm of the left arm also, but much less than of the right; the eyeballs were drawn strongly upwards and to the right. This was soon followed by violent twitching and contortions of the lower facial muscles, the left more than the right. A few moments later general convulsions occurred, and were repeated with great violence until 4 P. M. I happened to be present at the time, and decided to administer chloroform. This speedily quieted the convulsions, and they did not recur again.

During the following twenty-four hours was in a condition of stupor and could not be roused to speak or notice her surroundings, but there was no paralysis.

Then there was a gradual recovery, with return of the mental functions, though physically weak and incapable of exertion.

On the night of Nov. 3d had another rigor, and from this date on there were daily rigors, sometimes two or three in twenty-four hours.

The cough remained more or less troublesome, as also the pains in the chest referred chiefly to the right side; there was also progressive loss of weight and deterioration in general appearance.

The operation wound healed slowly, but so far as the original lesion was concerned it may be said that there was a cure of the affection; nor were there indications of any intra-cranial disease. The pulmonary complications, however, steadily increased, with a large area of dullness on the right side.

On Nov. 30th aspiration removed a small quantity of pus. On Dec. 1st, Dr. Garrow opened the right thorax, removing a portion of rib to insure better drainage, and on

Dec. 3d opened into the lung, which he found transformed into a pus cavity from base to apex. The patient gradually sunk and died of exhaustion on Dec. 6th.

This case was one in which prompt operative interference was clearly indicated and carried out as quickly as circumstances would permit. In every fatal case of suppurative otitis media there is a period during which the fatal lesion could have been forestalled by operative intervention. In this particular case the end of that period may have been reached with or shortly before the first chill, as the seeds of the fatal pulmonary lesion may, for aught we know, have already thus been sown. The condition of the jugular in the neck at the time of the operation renders it probable that the infection had reached the lungs even at that early period. In the absence of a post mortem investigation the violent convulsive seizure which took place on Oct. 23d has not been fully accounted for. The unusual features of this case were the early optic neuritis, the convulsions, and the further pulmonary complications affecting only the right side.

The virulence of the infection and its probable presence in other orvical veins was demonstrated by the abscess that occurred at the seat of operation in the neck despite the most painstaking antiseptic precautions.

Seeing then that the septic process may be practically beyond all control, from the moment that it passes into the tissues outside the bony capsule of the tympanum and mastoid, it is a question whether the rule should not be established that whenever an attack of pain occurs in the deeper parts of the ear, affected with chronic suppuration, an immediate radical operation should be done, without waiting for the onset of septic symptoms or definite signs of intracranial lesion, as so often happens.

Still better would doubtless be to insist, as I believe some aurists do, on a radical operation in every case found not

amenable to cure within a reasonable time by non-operative treatment.

DISCUSSION.

Dr. Sprague:—Within a month I was asked to see a case by one of my colleagues on which he had operated for mastoid inflammation. Four days before I saw the case sinus inflammation had developed, and within five days from that time optic neuritis developed, which rapidly progressed until the patient became blind. About ten days from that time the patient was sent to the hospital for operation, and twenty-four hours previous to admission patient had become comatose. I operated on the case and found a large septic clot in lateral sinus and sigmoid sinus, which I removed, established good blood-flow from the lateral sinus, but none from the jugular bulb, and not finding sufficient cause, as we thought, to account for the neuritis, I opened up the cranial cavity and examined the superior surface of the temporal bone, and also explored the temporo-sphenoidal lobe, but nothing was found. On recovery from the ether the patient was conscious, and from that time she began to improve fairly rapidly, and in two weeks was sitting up and feeling fairly well, but the optic neuritis began to increase, and although she had perception of light before the operation, she now had no perception of light. Seventeen days from time of operation she began to get uneasy and feel poorly, and did not wish to sit up any more. We thought it might be due to bi-chloride of mercury, which my colleague was giving her to see if it would not hasten the absorption of the exudate which was possibly causing the neuritis. The temperature began to rise and in five days she died. Meningitis rapidly developed. We could not get an autopsy, so could not tell what was the cause of death. It seems to me unique that there should be an optic neuritis with an uncomplicated sinus

thrombosis, and why it should have continued so long, I am at a loss to explain.

Dr. Bacon :—I think perhaps I have been misunderstood in regard to the position I take as to ligation of the internal jugular vein. I said that in recent cases in which the clot had not become disorganized in the sigmoid sinus, I thought we ought not to be in a hurry to ligate the vein even when the blood current had not been re-established from the lower or bulbar end. In this case which I reported I stated that we had to be as conservative as possible owing to the patient's general condition. If I had excised the vein I might have had an unfavorable result. It certainly would have been a great mistake in this case to have removed the vein. I have records of some six or eight cases now in which I follow the rule of waiting twenty-four hours, particularly when the clot is not broken down, and when there is no tenderness along the internal jugular vein in the neck. I have had results that certainly prove to me that in many cases ligation and excision of the vein are not necessary. I have had cases of course in which it was necessary to ligate, and I believe in ligating at once when the clot is broken down and there is tenderness in the neck.

In regard to what Dr. Crockett said about the ligation of the vein in the neck being very quickly done, I cannot agree with him. I have had some cases in which it was very difficult. When we come to dissect out the vein all the way to the clavicle, it not only takes considerable time in many cases, but adds considerably to the dangers of the operation. I have seen many cases terminate fatally even when a most radical operation had been performed. We do not cut off all source of infection when we dissect out the internal jugular vein. There have been a number of cases at the Eye and Ear Infirmary in which the patients died in a few hours after a thoroughly radical operation.

It seems to me it is a great mistake in surgery to interfere any more than is absolutely necessary. When we are in doubt as to the implication of the internal jugular vein, I think that it is much wiser to wait 24 hours, rather than run the risk of dissecting out a perfectly normal vein and thereby diminishing the chances of a successful result.

A STUDY OF THE SURGICAL RELATIONS OF THE FACIAL CANAL IN FIVE HUNDRED CRANIA.

By B. Alex. Randall, M. A., M. D., *Philadelphia, Pa.*

In the study of the anatomy of the temporal bone as presented in the actual specimens or in the numerous treatises one must be struck by the manifold variations encountered not only in its more superficial details, but in its internal construction, and especially in that matter so essential to the operator, its intrinsic and extrinsic relations. The beginner obtains a confused impression or else too schematic an idea of the anatomy—either of which seriously impedes good surgical work. I believe we cannot be too persistent in our efforts to clear up the confusion now existing, which is sometimes enhanced by writings, good in many respects, yet not broad enough in their view. Our picture of the temporal bone must be a composite, derived from not less than a thousand individual specimens, and in it I am sure that there will be found some sharp-cut features of nearly unvarying coincidence, faintly veiled by multiform variations in minor details.

In a recent preliminary paper (A. of O. XXXII, p. 144) I cited the claim lately renewed by Schwartze in the Archiv für Ohrenheilkunde (LVII, 96) that the course of the facial nerve is variable in such degree as to count decidedly at times against its safety in the operation of exenterating the tympanum and mastoid. Others have put forward the same view, but never with the explicit statement here met; while I have taught for years, that the

facial canal is one of the most *constant* and unvarying features of the temporal bone and that its descending portion is so near the exact *vertical* (Fig. 1) that it can be used as the surest guide to the proper placing of the detached temporal bone. It was natural that the old anatomists should look upon the bony structures as the more constant and as giving form to the contained soft tissues;

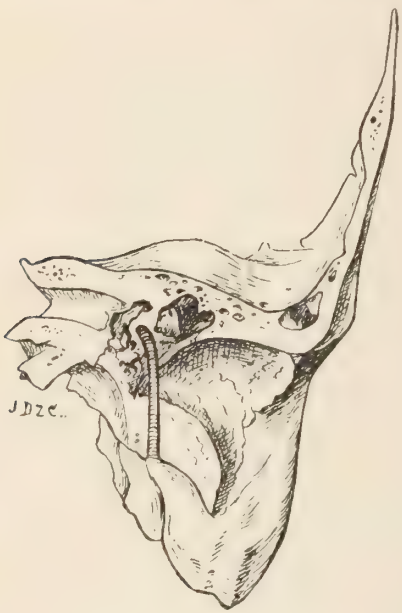


Fig. 1. Posterior half of Temporal vertically sectioned in the axis of the external Meatus and with Facial canal chiselled open to show its relation to the Tympanic Annulus. (Author's preparation.)

but we now know that the membraneous labyrinth and the facial nerve are more primordial and fundamental than the rather adventitious hard parts which develop about them. Many have yet to learn that these nerve-structures, and to a nearly equal extent the drumhead and ossicles adjacent, are virtually full-formed at birth and unchanging thereafter—sharing marvelously little in the growth and devel-

opment around them (Fig. 2). The separation of the labyrinth from its fellow of the opposite side may double as the cranial base develops between; yet unlike the eye, which more than doubles in volume during childhood, the labyrinth varies little if at all in extra-uterine life, maintaining an antero-posterior length of 16-17mm. The tympanic annulus, the lower margin of which is some

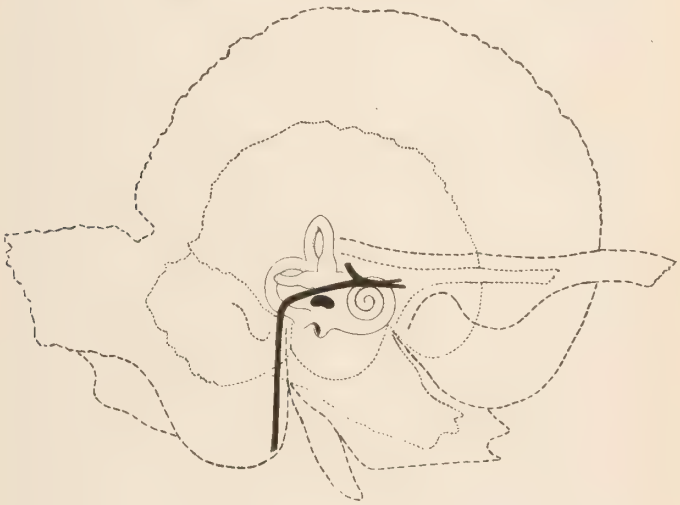


Fig. 2. Diagram of Labyrinth and Facial nerve unchanging in relation to the infantile and the fully developed Temporal.

30mm. from its fellow at birth, develops only outward to form the floor of the meatus and grows little if at all in diameter. It is forced outward to double its infantile distance from the median plane, yet undergoes in the process no known change in its own plane, although the squama and mastoid change as much in form and direction as in size. It must be evident, therefore, that no *a priori* reasoning can be applied as to those points which shall be regarded as the constants of the temporal; but by actual measurements the relations must be determined for individual specimens in sufficient number to exclude all proba-

bility of different findings. Even if a thousand temporal bones show no instance of such variation as Schwartze claims, its possibility among the anomalies must still be frankly conceded; although the burden of proof, as yet insufficient, rests upon him. Little can be determined from

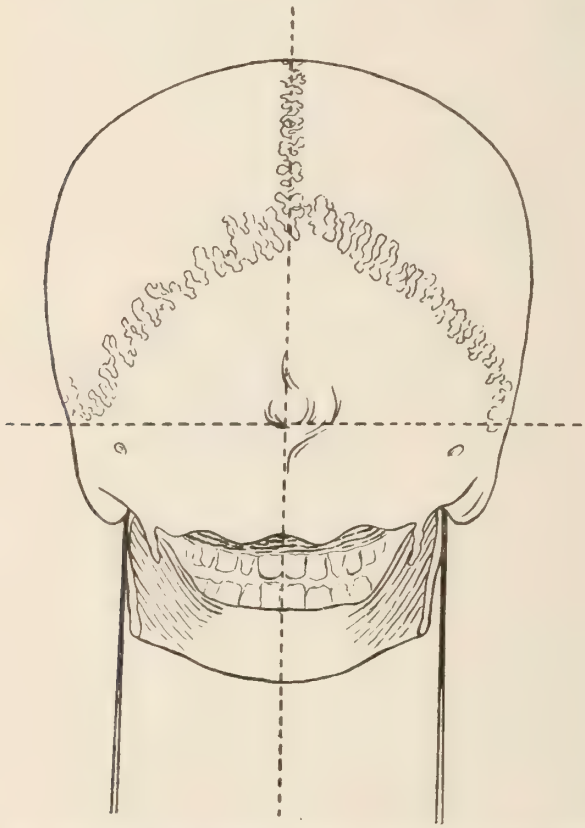


Fig. 3. Skull with Reid's base line and vertical indicated and a probe impacted in the descending portion of each Facial canal.

the detached temporal and our study must deal with the entire skull if we are to measure and not merely guess at the relations, as has too generally been done.

It is very easy to insert probes into the descending portion of each facial canal in the skull (Fig. 3) and deter-

mine their parellelism or any deviation from the vertical. It is still more precise to measure by the protractor any divergence laterally or antero-posteriorly from the perpendicular to the plane of Reed's base line. This I have done in five hundred skulls in the Mütter Museum of the Philadelphia College of Physicians and in the Wistar and Horner Museum of the University of Pennsylvania, supplemented by the few belonging to my own collection. I have studied the findings in relation to the cranial index on a large number of these, in respect to the age-development of the skull and also to the direction of the external auditory canal with which we are apt to compare it clinicly. I have also made a comparative study of all available skulls of the anthropoid apes, seeking any light which their conformation might throw upon the matter.

Asymmetry on the often unsymmetrical two sides and any relation of this to the unequal size of the jugular bulbs and lateral sinuses has also been sought in a large number of the specimens. I feel, therefore, that the study, if not exhaustive, has at least been fairly broad and I have striven to make it free from bias—often having a friend make or verify the measurements so as to lessen the personal equation. This source of uncertainty or error cannot be wholly excluded, for the facial canal is often irregular in form with a somewhat trumpet-shaped exit, leaving some room for choice as to when the probe is considered exactly in its axis. This simple method has often been supplemented and verified by measuring the lateral separation of the facial canals above the oval windows and comparing this with the distance between the stylomastoid foramina.

One first point noted has been the almost unvarying symmetry of finding on the two sides—the specimen presented (Fig. 4) being the sole notable exception. As the jugular bulb was often hugely larger on one side (*vide* these Trans. 1892, and Trans. Pan-American Congress 1898), this

factor in the growth and ultimate configuration of the bone seems to be devoid of any influence upon the direction of the facial canal. In the sagital plane there was an equal absence of deviation from the perpendicular—a very few specimens showing forward inclination up to 5°, while any backward course seemed due entirely to the large size of the exit and the deeper penetration of the probe into the curve of the canal above. In this respect symmetry was not complete but the deviation was very rare and slight. In relation to skull-index the varying findings as to lateral

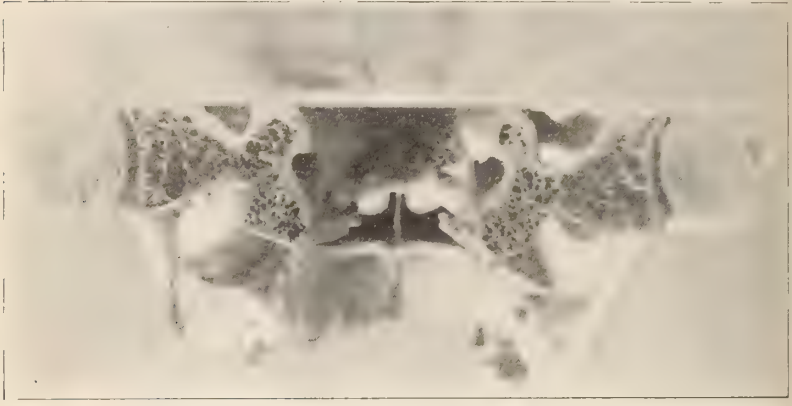


Fig. 4. Skull sectioned in Reid's base line and through facial canals, which are curved by reason of unequal encroaching para-mastoids. (Author's preparation.)

divergence from the perpendicular seemed without meaning. The absolutely vertical position of the descending portion of the facial canal was met in all types of skull from the extreme dolichocephalic to the extreme brachycephalic (.61 to .97.) The same must be said of the outward and the inward deviation, with no preponderant occurrence of either.

Coming now to the exact point of Schwartze's contention of *outward* inclination of the descending portion of the facial canal in the transverse plane, we have to note a

considerable proportion of such deviations in an unimportant degree. Sixty-five or some 13% showing a measurable outward deviation, while in fifteen the possibility of such deviation was not absolutely excluded, the precise axis of the canal being slightly in doubt. Of these but 25 were of more than 3° and only nine more than 5°—four instances being found where each canal diverged 10° outward from the perpendicular (skull-index .78 in two) and twice it was as much as 15° (skull-index .67 and .73). In all but one of these cases the para-mastoid portion of the bone encroached upon the exit of the facial canal and prevented the probe from occupying its axis and permitting of a measurement of its true direction, which seemed nearly vertical. So that among five hundred a single case in an otherwise anomalous mesocephalic juvenile skull of the Hyrtl Collection can be conceded as showing any notable outward deviation of the descending portion of the facial canal, which was to the amount of 10°. In the contrary matter of inward deviation of the descending portion of the facial canal a larger proportion was noted—110 to a measurable degree or 22%. In only 36 was it more than 5° and in 42 just 5°—the extreme deviations being 20 of 10°, 6 of 12° and 3 (index .77, .79 and .86) of 15°. Sixty per cent. of all the cases showed no measurable deviation from the vertical and the inward deviations were almost twice as numerous as the outward. In one single specimen above cited (Fig. 4) there is an outward deviation of some 15° apparent on the right side, while the opposite canal is vertical. In this instance the development of the paramastoid process is evidently responsible for the displacement of the exit of the facial canal and the section (Fig. 4) shows that the true course of the canal is as vertical as that of the other side, although on each side it presents an unusual curve, of which the chord is vertical or a little inward.

It may be of interest to note that with the one exception above noted no juvenile or infant skull was found to show outward deviation, nor was such found in the few chimpanzee skulls studied; but an outward deviation of from 3° to 30° and averaging more than 20° was invariably found in gorilla and orang skulls whether mature or not.

Clinically it may be convenient to compare the course of the facial with the axis of the external auditory canal, which former study (Trans. Am. Otol. Soc. '94) showed to be a variable; and it might be presumed that 'the slab-sided' dolichocephalic skull would show a more generally horizontal canal and an outwardly deviating facial. Neither is found to be the case. The average upward direction of the canal as it passes in is about 11°, while in nearly 40% it is exactly 10°. The skulls showing less inclination were generally brachycephalic, while the dolichocephalic averaged 12° upward, a single skull of index .771 in my series showing as little as 8° on one side. Some of the maximal inclinations (14°—17°) were in dolichocephalic, while the minimal (8°—5°) were in brachy- or meso-cephalic crania. As most of the outward deviations of the descending facial canal were apparent only, it suffices to note that the one case of 10° outward course had but 8° of upward inclination to the meatus, a virtual compensation; but those with inward deviation of the Facial often showed minimal upward course of the meatus and averaged 11°—one of 10° inward deviation of the facial having but 5° upward course of the external meatus, which in some of the vertical facials was as much as 16° upward. The axis of the external meatus may be at an angle to the course of the facial varying from 74° to 95°.

It does not appear, however, that this entails any difference of relation of the course of the facial to the plane of the annulus and drumhead, for I have yet to find any specimen in which the lower margin of the annulus was

otherwise than 3-4mm. internal to the corresponding portion of the facial canal. The forward inclination of the meatus has been shown to vary from 0-20°, but this seems not to affect our problem, since I have always found the facial 2-4mm., usually 3mm., posterior to the middle of the back of the annulus.

Variations, therefore, in the course of the facial canal sufficient to have surgical importance have been absent in these 500 crania, as in all the other specimens which I have studied; and it seems best to avoid any teaching of inconstancy in its course, but rather that other elements of the anatomy vary and may demand extra caution in operating.

DISCUSSION.

Dr. Bryant:—I have listened to Dr. Randall's paper with much interest. I agree with him in saying that the course of the facial canal is remarkably constant. I have never had the pleasure of seeing such an unusual bone as he has here, although I have seen many hundred.

Dr. Randall's remark that the change after birth in the development of the tympanum proper is very slight, is true, I think, and is evident on inspection.

Dr. Sprague:—I recollect a case which I dissected, within the tympanum, right at the union of the inner wall the nerve came through and traversed the inner wall, and full 3-16 of the nerve was covered simply by mucous membrane. It was in an adult. It is easy to see how a chisel might slip and cut the nerve.

Dr. Bryant:—Dr. Sprague's case is an interesting one, yet not unheard of. The tympanic cavity may vary considerably. Its dimensions ars not constant.

A FEW SUGGESTIONS IN AURAL TREATMENT.

By George B. McAuliffe, M. D., *New York, N. Y.*

The removal of exostoses from the external auditory canal has generally been accomplished by means of chisel, gouge, trephine or drill, or by modifications of these instruments designed to protect the deeper structures. The auricle is usually disengaged from its bony attachment to facilitate the operation. I was led some time ago to try simpler means, by the necessity of immediate treatment in one case and by a peculiar complication in another case. A patient with an exostosis was placed on a table by a surgeon who proposed to lay the auricle forward and by means of chisel and mallet to disengage the growth. As soon as the man began to take the anaesthetic he had a violent epileptic fit. The operation was abandoned. The first case was going abroad the next day. The exostosis almost filled the lumen of the canal. I passed a small hook back of the growth and, having secured a grip after a few trials, was able to break away the entire growth without any trouble. Encouraged by this I repeated the procedure in the epileptic and had no trouble in evulsing the bony tumor.

Occluding exostoses are generally polypoid in character and although presenting on first sight no pedunclation, ordinarily evidence a little rocking movement which demonstrates that they are not sessile. I have never found it necessary to chip off a portion of the subjacent bone to prevent recurrence, and feel certain that a great many cases will respond to this minor surgical procedure, which is nearly painless.

The most delicate step in the tympano mastoid exenteration is the cutting away of the external wall of the aditus ad antrum. Various measures have been brought forward to facilitate its removal without endangering the subjacent structures. The method described by Randall has been to me the most satisfactory. In a few cases I have tried as soon as I had thinned the bone down to use the Gigli wire saw passed through the aditus. It is necessary to cut off one of the loops in order to facilitate its passage. It can then be used as in brain surgery to cut its way cleanly out above and below.

Post mastoidectomy temperature has always appeared to me as septic owing either to hospital atmosphere or to foci remaining (favorite sites being the zygomatic, tip, and occipital cells) or to absorption during the operation. The most radical operations are generally the most afebrile. Apart from this sine qua non it has been my practice to get rid of all blood clots contrary to the views expressed in their favor and to flush the wound several times with hydrozone and alcohol. The first strip of gauze is used as a sponge and into as dry a cavity as practicable the dressing is applied, I have left, after such treatment, the primary dressing as long as ten days, no indication existing for its removal even then. I never disturb the granulations by syringing but simply repack, sometimes insufflating a little boric acid. The afebrility of a number of my cases has led me to believe that this plan is the best.

The greater number of earaches occur at night. There are many reasons for believing that the dorsal decubitus so beneficial in quieting the circulation in other inflammations is not the best posture for threatened or existing middle ear disease. The position of the pharyngeal mouth of the Eustachian tube (an inch below the level of the tympanic mouth) in the erect posture is designed to call

gravitation into play to assist the protection of the tympanum. In the recumbent position the pharyngeal mouth is above the tympanic orifice and gravitation into the tympanum of infected, disordered tubal secretion uncontrolled by ciliary defense would seem an easy matter, although it is a mootable question whether or not corpuscular infection takes place from the tube. The circulatory balance of the ear furthermore is theoretically not so good in the recumbent as it is in the erect posture. It would seem proper then to modify the position of the aural patient so that he lies semi-reclining with the helix of the affected ear uppermost to gain forward and downward drainage.

The Javanese Method has afforded me a means of anaesthesia of the drum membrane during paracentesis. It consists in the compression of the two carotids thus inducing an anaemia of the brain and depriving the sensorium of perception of peripheral pain. It is a practicable means of anaesthesia yet it is difficult to avoid compression at the same time of the internal jugular. When the pressure is properly applied a feeling similar to the effect of aconitia ensues with beginning loss of consciousness and inability to resist treatment. The method while smacking of garroting is an efficient and transitory means of aural anaesthesia which lasts as long as the pressure is maintained. This pressure is applied best where the carotids are most superficial in the upper part of their course. It is well after allowing a sufficient amount of tissue over the larynx to press backward as close as possible to that structure.

Tubal Adhesions. Many cases of tubal catarrh with the attending aural disturbances are kept up by adventitious bands binding the medium cartilaginous plate of the tube to the pharynx. These bands—the sequelae of adenoid tissue or chronic nasopharyngitis—interfere with the

mobility of the tube, and tend to keep up the passive congestion which is the essential feature of salpingitis more than the surface catarrh of its lumen. They are easily broken down by the finger swept down into the fossa of Rosenmueller. In some cases this procedure has accomplished more good to the hearing and tinnitus than months of routine treatment.

DISCUSSION.

Dr. Randall:—We certainly do see these growths cartilaginous with or without a bony centre, and we have many exostoses which are stony hard. Clinically we see not infrequently small exostoses on the anterior and posterior horns of the annulus, but I believe there is no single instance of this on record in the macerated bone. Stony hard as they appear to be, they are transient and fibrous, and disappear. These cases must be dealt with according to the exact findings. Some of them as Dr. J. Orne Green has shown, lie loose and seem entirely unconnected with the surrounding or underlying tissues.

In regard to the point raised by Dr. McAuliffe of the dorsal decubitus, in its relation to earache. When a patient goes to bed with an inflamed tympanum there is some discomfort there, possibly some pain, and the child nestles its ear down into the pillow. The temperature of that ear, pressed for protection into the pillow, is soon the same as the increased body heat and there is some moisture. Then in turning over an ear at 100° or more is exposed to a room temperature of 70° and accentuated by evaporation, there may be a change of 50° in a few minutes. The healthy ear will hardly undergo safely so marked a change, and the patient will soon awake with a scream, as we all know, with a severe earache. Now if when the child goes to bed the ears are covered with a light flannel cap, covering the entire aural region, it will

protect the ears thoroughly. I think all of our eruptive fever cases should have their "night-caps," for day as well as night, and that we should insist upon this on the part of the general practitioner, as it is one of the valuable prophylactic and therapeutic measures in these cases.

Dr. McAuliffe:—I carefully made the distinction between exostoses and hyperostoses. The former are more or less polypoid in character, and always have, so far as I have seen, a pedicle. They grow very slowly, and rarely occlude the canal. We find that some cases start from brachycephalic development and some from a habit of constant picking. This starts a periostitis that takes on bony formation and these cases go on as a rule until there are more or less symptoms in the canal. Every case I have operated on has shown a small pedicle.

In regard to the position of the aural patient, unless we seek for drainage through a perforation of the drum, we must seek for it through the Eustachian tube, and inasmuch as the tympanic orifice in children lies on a lower level than in adults it becomes a practicable means of drainage as we see in children. In the position of the patient, with the helix of the effected ear uppermost, and semi-reclining we would accomplish drainage through the Eustachian tube.

REPORT OF A CASE OF FIBROMA OF THE EXTERNAL AUDITORY CANAL, WITH SERIOUS REFLEX SYMPTOMS.

By W. S. Bryant, M. D., *New York, N. Y.*

Through the kindness of Dr. F. L. Jack, in whose clinic at the Massachusetts Charitable Eye and Ear Infirmary the patient was treated this spring, the following report of an unusual case is made.

Inspection. A well developed, excited, neurotic woman, with a worried and haggard expression; slight exophoria, and inferior turbinals engorged, occluding nares. The right ear normal. Left ear closed near external orifice of the meatus by a bagging of its superior wall. Skin normal over this tumor.

Hearing for voice, { Right ear normal. / Left ear $\frac{3}{20}$.

No view could be obtained of the left tympanic membrane though the superior wall of the meatus was somewhat compressible and not very sensitive.

History. The patient said to be between 30 and 35 years old; married; of American parentage. A uterine "fibroid" had been removed some years ago. History otherwise negative. The present condition had lasted more than a year, and many attempts at relief had proved unavailing, the occlusion of the meatus becoming more and more complete, and her ability to open this canal by pulling on the ear less and less. She said that she would be wakened several times in the night by the oppression

in her head and could not sleep again till she had relief by opening the meatus in this way. But that lately it had become often impossible to do this. This account seems to emphasize the disagreeable effects of the vacuum in the proximal end of the left meatus due to the hermetical sealing by the tumor.

Patient complains bitterly of deafness and inability to do any work, read, sew or fix her attention without extreme effort; inability to sleep, and consequent irritability, nervous exhaustion, and mental confusion. She said that she was practically helpless, no use to herself or any one else, and that she wished to die if she could not be cured.

Diagnosis and *Treatment*. Osteoma. Meatus packed with glycerine tampon.

Next visit: The swelling of the superior wall had decreased enough to admit a small speculum and cerumen was seen. Diagnosis changed to impacted cerumen. Cerumen removed and diagnosis again changed to cyst, and later to lypoma.

The true diagnosis of fibroma was not made until after microscopic examination of the tumor.

Operation. The patient was anestheticized with nitrous oxide gas, and a small puncture made through the skin over the external end of the tumor. A yellow mass protruding through the wound was readily removed by forceps. It was not in the least adherent and lay subcutaneously. The tumor was cylindrical, yellow and elastic. It looked like fat. It was nearly an inch long by $\frac{1}{4}''$ at the external end and $\frac{1}{8}''$ at the internal end.

The wound healed immediately and the normal calibre of the meatus was restored.

On the third day after the operation, hearing in both ears normal.

Patient said that as soon as she had quite gained mental equilibrium after the anesthetization she found complete relief from her symptoms, and that she now had perfect nasal breathing, a condition which she could scarcely remember to have enjoyed before.

When last seen the patient showed marked physical improvement, with gain in weight and a good color, and appeared to be in perfect health. She had had no recurrence of her distressing symptoms.

Hystological examination of the tumor. A fibroma of the kiloid variety, composed of fairly large connective tissue cells with elongated nuclei. Some of the cells arranged in whirls, and scattered areas of hyaline degeneration. There were small hemorrhages, caused probably by the forcible packing of the meatus.

Literature. No previous report could be found of a case of fibroma of the external auditory meatus, nor of a case of similar reflex nervous symptoms originating from the external auditory meatus.

DISCUSSION.

Dr. Bacon :—It seems to me that it is always important, after the removal of growths to examine them microscopically. I had a case a few years ago of a small growth, which was from its appearance, apparently a polypus. Later I was very much surprised to hear from the pathologist that it was malignant in character, and it seems to me, important on account of the surprises we sometimes meet with, to examine all these cases microscopically.

A PRACTICAL SUGGESTION IN REGARD TO THE USE OF POLITZER'S INFLATION.

By Frank Buller, M. D., *Montreal, Canada.*

It is many years since Politzer's method of inflating the middle ear came into general use among aural surgeons, and it appears to be one of the things that has come to stay.

A contrivance so simple ought surely to have been made perfect long ago, for its intended purpose, and anyone desiring to obtain the most perfect instrument of its kind should have no difficulty in procuring one from the people who sell these things. Let us see how the matter stands.

The instrument consists of three parts: 1st, A compressible fairly strong and elastic rubber bulb or bag of from 4 to 8 ounce capacity, and usually provided with a valve at the end or side for the admission of air. 2d, A short nozzle, onto which a piece of rubber tubing of variable length is attached. 3d, A nose piece or detachable nozzle, which is supposed to be constructed to fit any patient's nostril, so that compression with the fingers and thumb will prevent the escape of air around the nozzle during the act of inflation.

With the two first I have no fault to find, but with regard to the last I find nothing but faults. A perfect nose piece should fit any nostril, so that it can be made air tight; it should be aseptic, and easily kept so; it should cause no discomfort to the patient; it should, so far as possible, protect the surgeon's fingers from being soiled by nasal secretion.

The nozzles obtainable from surgical instrument shops are:

(1) A curved piece of hard rubber tubing, something like a short eustachian catheter. Nothing could be worse than this; it fits no nostril; it is difficult to keep aseptic; it hurts the patient; it does not protect the surgeon's fingers; it is, in short, a rank abomination, and only fit to be consigned to oblivion.

(2) A smooth hard rubber bulbous tip of ovoid transverse section.

(3) A somewhat similar nozzle and bulb made of glass.

(4) Sundry other contrivances, all more or less imperfect.

Both of these are open to the serious objection that there are many nostrils they cannot be made to fit, and they do not fully comply with the other three essential qualities of a perfect nozzle. That which I have to show you does fulfil all the requirements, and if you will take the trouble to try it, I think you will agree with me that it really is a practical suggestion of some value. The nozzle is of hard rubber and of the usual form, but smaller and less rounded; over this I slip a short piece of unglazed rubber tubing, this gives a surface which absorbent cotton readily clings to. I now wrap the nozzle with a layer of cotton just about in the same way as it is applied to the tip of the little instrument known as a cotton applicator.

It will readily be seen that the contrivance can be instantly made to fit any nostril by using more or less of the absorbent cotton. Moreover, it constitutes an absolutely perfect occluder; it is soft and gives no discomfort to the patient; it is aseptic since only a clean material comes in contact with patient's nostril, the aperture is so covered by the cotton that no secretion can possibly be drawn into it.

Every time the instrument has been used, just pull off the cotton and clean the nozzle with ordinary water, and

you have it in perfect condition for future use. The fourth requisite, that of preventing the surgeon's fingers being soiled, is attained by the perfect occlusion which prevents even the smallest quantity of air from being forced out through the anterior nares.

There is one other great advantage in this modified nozzle: perfect occlusion of the nares also secures a more uniformly successful inflation, and enables the operator to regulate the effect with greater accuracy. For about two years I have used this contrivance, and can recommend it as being entirely satisfactory.

DISCUSSION.

DR. RANDALL:—I learned about this very thoroughly many years ago from my master, Dr. Risley of Philadelphia. Most of the olivary tips that are on the market have the long or spindle form. When I was with Politzer he was using the short piece of rubber tubing over the nozzle of the Politzer bag, and his assistant of that day was able to make a nose bleed with every inflation. If the olive tip is properly made of hard rubber it will rest just inside of the nostril as a rule, and need not injure the part or produce fissures. However, that is not always to be avoided whether we use Dr. Buller's tip or any other. I advocate one with a short neck which enables the fingers to come close up to the nose, yet they are protected quite as completely as in Dr. Buller's. It is as Dr. Buller says, almost impossible to get these things good in the market. Everyone I buy, unless made especially for me, I have to drill out to get the proper amount of lumen, which is often minute. Another point which I learned from Dr. Risley, always round off the tip of the Politzer bag for use in the catheter; then instead of jamming it in, you simply have a ball and socket joint. We have an air-tight closure, with

none of the jamming or pulling which compels most men to interpose a most undesirable bit of rubber tube.

Dr. McAuliffe :—Some ten years ago I had the rubber olive-shaped tip of the Politzer bag made of glass on account of its asepticity. They are now generally used. I do not think it makes much difference, if you close the orifice, what kind of a tip you use. The shorter the tip the better.

Dr. Fiske :—I should like to say a word about cleaning out well. I favor the glass tip. It seems to me that the Doctor's point about the cotton is very well taken, because the secretion is kept out of the tip.

Another point I would like to speak of, and that is the question of getting air into the catheter. The Politzer bag used in the catheter does not give a constant stream of air, whereas, when you use a double balloon the stream of air is constant, and I find it more satisfactory.

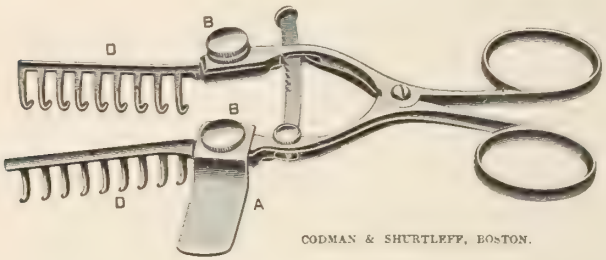
Dr. Buller :—I want to point out and insist upon the fact that in practice we want something we can take up and use right then and there in every case. I do think that any of the tips obtainable from surgical instrument makers will fit all cases, but this simple contrivance I present to you can, as stated, be made to fit any patient, or I should say any nostril, and I think if you will try it you will find it produces most perfect occlusion in every instance.

Note.—These nozzles can be obtained from Meyrowitz, New York.

A MASTOID AND AURICLE RETRACTOR.

By Frederick L. Jack, M. D., *Boston, Mass.*

The mastoid part of this instrument is a modification of Allport's retractor and Jansen's mouth gag. The additional simple device to hold the auricle is thought to be new. The following cut illustrates the many advantages of the instrument.



There are three sets of blades varying in length to fit different lengths of incision. Two sets only are recommended. The teeth are placed close together and with the blades in position the edges of the wound are widely separated so as not only to afford sufficient room for operating, but to control hemorrhage. The handles are pressed together like those of scissors and held in place by a ratchet. The instrument is quickly adjusted and absolutely self retaining.

The auricle, which is often in the field of operation, requiring an assistant to hold it well forward out of the opertive field, is now perfectly held aside by means of the ear tip. (A) — The tip is simply a thin piece of metal ad-

justed to a groove in the head of screws. (B) — Both heads are grooved so that it can be readily used for the right or left ear. After the retractor is in place the upper half of the auricle is folded over and held in place by adjusting the tip in the groove.

The instrument has been carefully made by Codman & Shurtleff, Boston.

ALPHABETICAL INDEX

—OF—

OTOLOGICAL BIBLIOGRAPHY, FROM JUNE 1, 1902 TO JUNE 1, 1903.

COMPILED BY

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AND

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TRANSACTIONS

OF THE

AMERICAN OTOLOGICAL SOCIETY,

THIRTY-SEVENTH ANNUAL MEETING.

ATLANTIC CITY, N. J.

JULY 11 and 12.

VOLUME VIII, PART III.

PUBLISHED BY THE SOCIETY:
MERCURY PUBLISHING COMPANY, PRINTERS,
NEW BEDFORD, MASS.
1904.

Extra copies may be had by addressing the Secretary, Dr. F. L. Jack, 215 Beacon street, Boston, Mass., or Mercury Publishing Company, 112 Union street, New Bedford, Mass.

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Dr. Hiram Woods,	842 Park Av.,	Baltimore, Md.

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* Associates.

† Temporarily at Santa Barbara, California.

American Otological Society.

The Thirty-seventh Annual Meeting of the American Otological Society was held at Hotel Chelsea, Atlantic City, Monday and Tuesday, July 11th and 12th, 1904. The meeting was called to order at 10.30 A. M. by the President, Dr. B. Alexander Randall, Philadelphia.

The following members were present:

Drs. John L. Adams	New York, N. Y.
Joseph A. Andrews	New York, N. Y.
Gorham Bacon	New York, N. Y.
T. P. Berens	New York, N. Y.
Clarence John Blake	Boston, Mass.
W. Sohier Bryant	New York, N. Y.
W. H. Carmalt	New Haven, Conn.
Charles N. Cox	Brooklyn, N. Y.
Edward B. Dench	New York, N. Y.
B. E. Fryer	Kansas City, Mo.
John Green	St. Louis, Mo.
G. W. Hale	Nashville, Tenn.
Herbert Harlan	Baltimore, Md.
Thomas J. Harris	New York, N. Y.
David Harrower, Jr.	Worcester, Mass.
C. R. Holmes	Cincinnati, O.
Frederick L. Jack	Boston, Mass.
Charles J. Kipp	Newark, N. J.
G. A. Leland	Boston, Mass.
John C. Lester	Brooklyn, N. Y.
Francis R. Packard	Philadelphia, Pa.

Drs. Wendell C. Phillips	New York, N. Y.
Thomas R. Pooley	New York, N. Y.
B. Alex. Randall	Philadelphia, Pa.
R. G. Reese	New York, N. Y.
Henry O. Reik	Baltimore, Md.
Charles W. Richardson	Washington, D. C.
Charles E. Rider	Rochester, N. Y.
Samuel D. Risley	Philadelphia, Pa.
Samuel Theobald	Baltimore, Md.
Hiram Woods	Baltimore, Md.

The Treasurer's report for the year was presented and read by the Secretary and the President appointed Dr. H. O. Reik of Baltimore to serve as Auditor.

The President then announced the appointment of the following named gentlemen as a Business Committee: Drs. G. A. Andrews, New York; John Green, St. Louis; and G. A. Leland, Boston.

The Secretary presented a communication from the Congress of American Physicians and Surgeons in reference to the sending of a representative to the Congress to be held in 1907. Upon vote of the Society all the communications bearing upon this subject were referred to the Business Committee, as was also a communication from the American Medical Association inviting this Society to affiliate with that organization.

Dr. Richardson of Washington requested, and was granted, permission to introduce Dr. W. H. Fitzgerald of Hartford, Conn., as a guest of the Society.

The Auditor reported that the Treasurer's report had been examined and found correct in every particular.

The following papers were presented:

I. Dr. T. Passmore Berens, New York, N. Y. An Anomaly in the Course of the Facial Nerve of Surgical Importance. Exhibition of the Specimen.

II. Dr. H. O. Reik, Baltimore, Md. The Relation-

ship between Otitis Media (Non-Suppurative) and Facial Paralysis of the Refrigeratory Type.

Discussed by Drs. Richardson, Blake, Leland, Jack, Randall, Berens and Reik.

III. Dr. William Sohier Bryant, New York, N. Y. Tinnitus Aurium; Diagnosis and Differentiation.

IV. Dr. H. O. Reik, Baltimore, Md. A Consideration of the Vascular Theory of Tinnitus Aurium.

Discussed by Drs. Blake, Randall, Leland, Fitzgerald, Bryant and Reik.

Adjournment of morning session.

AFTERNOON SESSION.

The President announced that, in the absence of two members of the Membership Committee, Drs. Prout and Theobald, he would appoint Drs. Carmalt and Leland to act with Dr. Bacon on this committee.

The reading of papers was then resumed as follows:

V. Dr. Charles W. Richardson, Washington, D. C. Osteomyelitis of the Temporal Bone.

VI. Dr. Edward B. Dench, New York, N.Y. A Case of Extensive Acute Osteomyelitis of the Temporal Bone. Operation; Recovery.

Discussed by Drs. Berens, Phillips, Dench and Richardson.

VII. Dr. Wendell C. Phillips, New York, N. Y. Radical Operation for Chronic Suppurative Otitis Media with Acute Mastoid Exascerbation; Latent Meningeal Symptoms secured later from members of the family. Operation immediately followed by Leptomeningitis. Death.

Discussed by Drs. Dench, Holmes, Fryer, Randall, Blake, Reik, Harris, Pooley, Jack and Phillips.

VIII. Dr. Thomas R. Pooley, New York, N. Y. A Case of Fibroma of the External Ear.

IX. Dr. B. Alexander Randall, Philadelphia, Pa. Notes on Neoplasms of the Ear.

Discussed by Drs. Dench, Pooley, Reik, Holmes, Bacon, Blake and Randall.

The Society then went into executive session.

The Chairman of the Business Committee, Dr. Green, reported that owing to the number of subjects which they had to consider he was unable to present a full report and asked that the matter might be deferred until the next session.

The Committee on Membership recommended the election as associate members the following named candidates:

Dr. Emil Amberg, Detroit, Mich.
Dr. Arthur B. Duel, New York, N. Y.
Dr. Percy Fridenberg, New York, N. Y.
Dr. George E. Shambaugh, Chicago, Ill.
Dr. James E. Logan, Kansas City, Mo.
Dr. Franklin M. Stephens, New York, N. Y.
Dr. Frank J. Blodgett, New York, N. Y.
Dr. Ernest U. Buckman, Wilkesbarre, Pa.
Dr. Richard Jordan, New York, N. Y.

There being no challenge of the names recommended by the committee, the President announced that these candidates were duly elected to associate membership.

The committee further recommended that the further list of candidates which they had under consideration should be referred to the committee for next year. This recommendation was unanimously adopted.

Dr. Blake offered the following resolution as an amendment to the By-Laws of the Society: "That a standing committee be created whose duty it shall be to secure scientific papers for presentation at the Annual Meetings,

and to arrange for a consideration of some particular subject, or group of subjects, relating to otology; such committee to be appointed for the ensuing year, at each Annual Meeting; the committee to consist of the President *ex-officio*, and of two other members to be appointed by the President."

On motion of Dr. Carmalt this resolution was referred to the Business Committee.

Adjournment.

Tuesday, July 12, 1904.

Called to order at 10 A. M.

The reading of papers was resumed as follows:

X. Dr. Thomas J. Harris, New York, N. Y. Electrolysis of the Eustachian Tube. A Further Report.

Discussed by Drs. Dench, Bacon, Holmes and Harris.

XI. Dr. Clarence J. Blake, Boston, Mass. Middle Ear Tension as a Factor in Auditory Vertigo.

Discussed by Drs. Dench, Kipp, Bacon, Fryer, Theobald, Randall and Blake.

XII. Dr. Clarence J. Blake, Boston, Mass. The Prolonged Treatment of Chronic Suppurative Middle Ear Disease.

Discussed by Drs. Kipp, Pooley, Bacon, Theobald, Dench, Holmes and Blake.

XIII. Dr. Gorham Bacon, New York, N. Y. Report of a Case of Sigmoid Sinus Thrombosis. Operation without Ligation of the Internal Jugular Vein. Recovery.

Discussed by Drs. Kipp, Pooley, Dench, Randall, Holmes, Blake, Jack and Bacon.

XIV. Dr. W. S. Bryant, New York, N. Y. Exhibition of a Patient with Epidural Abscess. Operation; Closure of Wound followed by Rapid Convalescence.

Discussed by Drs. Bacon, Bryant, Jack, Dench, Blake, Woods, Reik and Randall.

XV. Dr. Charles J. Kipp, Newark, N. J. Fatal Case of Otitis Media Purulenta with Meningitis.

Discussed by Drs. Randall, Dench and Kipp.

XVI. Dr. W. S. Bryant, New York, N. Y. Demonstration: A Phonographic Apparatus for Testing the Hearing.

The Society then went into executive session.

The Chair made reference to the death during the past year of Dr. William Rankin, Jr., Newark, N. J.; Dr. Edward Fridenburg, New York; and Dr. William W. Seeley, Cincinnati, O.

The Chair called attention to the fact that on the list of the Secretary there were several delinquent members, and that according to the rules they might be dropped from the roll of membership. The Secretary was instructed to vigorously notify these members that unless responses were promptly forthcoming, they would be dropped.

Dr. John Green, Chairman of the Business Committee, presented the following report:

First. The committee recommends the adoption of the amendment to the By-Laws, submitted at the last session by Dr. Blake.

Second. In regard to the letter from the American Medical Association suggesting affiliation with that organization, the committee recommends the adoption of the following resolution, and that a copy thereof be sent to Dr. J. N. McCormack as the representative of the American Medical Association: "Resolved, That in view of the special scope and business of the American Otological Society it is inexpedient to consider anything looking to its affiliation with another organization."

Third. The committee recommends that all matters pertaining to the next Congress of American Physicians

and Surgeons be referred to the Otological Society's representative on the Executive Committee, with full power and authority to act.

Fourth. The following names were submitted in nomination for officers of the Society for the ensuing year:

President	Dr. B. Alex. Randall
Vice-President	Dr. William H. Carmalt
Secretary and Treasurer . . .	Dr. Frederick L. Jack
Committee on Membership . .	Dr. Samuel Theobald Dr. Emil Gruening Dr. G. A. Leland
Committee on Publication . .	Dr. Clarence J. Blake Dr. J. Orne Green The Secretary *(ex-officio)*
Delegate to the Congress . . .	Dr. William H. Carmalt
Alternate	Dr. F. B. Loring

The above report of the Business Committee was unanimously adopted and the Secretary was instructed to cast the ballot for the election of the officers named.

The special committee on time and place of meeting, through its chairman, Dr. John Green, presented the following report:

The committee appointed at the meeting of 1903 to determine the place and time of the meeting of 1904 respectfully reports:

That this committee, acting also for the American Ophthalmic Society under authority conferred by that Society at its meeting of 1903, fixed upon Atlantic City, N. J., and Monday and Tuesday, July 11th and 12th, as the place and days of the meeting of the American Otological Society for 1904.

The committee, in obedience to a further duty imposed on it by the terms of its appointment recommends that, in the future, the determination of the place and

time of each annual meeting be entrusted to a standing committee of three members, such committee to be appointed annually by the President.

In case of the appointment of a committee of similar character by the American Ophthalmic Society, it is recommended that the committees appointed by the two Societies act together, as a joint committee of conference, with a view to the selection of a common place of meeting and of such dates for the meetings as may be most convenient for both Societies.

Respectfully submitted for the committee.

JOHN GREEN, Chairman,

F. B. LORING,

S. O. RICHEY.

Dr. Gorham Bacon offered the following amendment:

To strike out the words "such committee to be appointed annually by the President," and insert "such committee to be appointed by the Society," and that the original committee appointed last year be asked to serve this year, *i. e.*, Drs. Dench, Lewis and Crockett.

Dr. John Green offered an amendment to Dr. Bacon's amendment to the effect "that in the selection of the members of such committee the election be upon nominations from the floor."

The Society voted the adoption of Dr. Green's amendment by a vote of six to five.

That part of the resolution as finally adopted then read, "That in the future determination of the place and time of each annual meeting be entrusted to a standing committee of three members, to be elected annually by the Society upon open nominations."

The following nominations were made: Dr. Dench, Dr. Crockett, Dr. Theobald, Dr. Lewis, Dr. Risley and Dr. St. John.

On motion of Dr. Carmalt it was decided to vote by writing three names, the three highest to be considered elected.

The Chair appointed Dr. H. O. Reik teller.

Drs. Dench, Crockett and Lewis were elected.

The President expressed his thanks for the further confidence reposed in him in again electing him to the chair.

The Society then adjourned.

FREDERICK L. JACK,

Secretary.

AN ANOMALY IN THE COURSE OF THE FACIAL NERVE OF SURGICAL IMPORTANCE; WITH EXHIBITION OF THE SPECIMEN.

T. Passmore Berens, M. D., *New York, N. Y.*

At the last meeting of this Society, during the discussion of Dr. B. A. Randall's paper "A Study of the Surgical Relations of the Facial Canal in Five Hundred Crania" I described "An Anomaly in the Course of the Facial Nerve" of surgical importance. Since my discussion was omitted from the Transactions of the Society, I have deemed it wise to present the *specimen*, which, as you

will note, is a wet alcoholic preparation of the left adult temporal bone, with the filaments of the nerve *in situ*. The nerve, which is colored black for photographic purposes, is exposed from the point of its entrance in the cavity of the tympanum. It takes the usual course between the foramen ovale and the external semi-circular canal, where it bends downward and slightly backward at its proper level for 2 mm., when it turns outward and pursues a straight course, traversing in an oblique direction the posterior wall close to the mastoid cells to its point of exit, which is one centimetre external to a rudimentary canal, indicated by a small sulcus between the styloid process and the mastoid process, in which is sticking the pin. You will notice further by viewing the sec-

tion of the bone containing the nerve, that for a space of 3 mm. the nerve is a centimetre external to its usual course. In short, the nerve, from where it leaves the tympanum to its point of exit, marks almost perfectly the line of the bone wound resulting from the Schwartze-Stacke mastoid operation; and the nerve would certainly be wounded in this operation. At its point of exit the nerve bends sharply inward, and probably reached in its external course nearly to its normal position in the neck.

There is another point of interest in this bone: a sulcus extending from the attic posteriorly from just behind the foramen ovale and reaching 3 mm. *beneath* the nerve, and ending in a blind pouch. This might readily be taken for the aditus, or in diseased conditions could readily complicate surgical procedures in this locality, for the nerve could scarcely escape injury.

This anomaly was found by Dr. E. S. Thomson, one of the surgeons of the Manhattan Eye, Ear and Throat Hospital, while engaged in making anatomical preparations for teaching purposes.

Schwartz in the *Archiv fuer Ohren Heilkunde*, LVII p. 96, among other anomalies of the facial nerve described, mentions one class in which "the facialis may approach so closely the external table of the mastoid process that the first stroke of the chisel may injure it." He also mentions a class that he describes as "Schraegverlauf" (Oblique Course), and it seems to me that the course pursued by the nerve in this specimen is a combination of these two classes.

THE RELATIONSHIP BETWEEN OTITIS MEDIA—(NON-SUPPURATIVE)—AND FACIAL PARALYSIS OF THE REFRIGERATORY TYPE.

H. O. Reik, M. D., *Baltimore, Md.*

In a paper read before the Johns Hopkins Hospital Medical Society, December, 2, 1901, I called attention to what I believed to be a neglected factor in the consideration of facial paralysis; a factor which is of importance not alone as a means of explaining the pathology of the majority of cases of this affection, but is of prime importance in determining their proper treatment. In that paper I announced the conviction that "*In the majority of cases, if not indeed in all, of facial paralysis of the "refrigeratory" or "rheumatic" class, an acute or subacute otitis media is an intermediary condition between the exposure to cold and the appearance of the paresis.*"[1] I was first led to this conclusion by the fact that I had within a very brief period of time observed four cases of facial palsy of this type, in which the middle ear was involved in a mild catarrhal inflammation just prior to the onset of the paretic symptoms and which presented, coincidently, a collection of fluid in the tympanum, the evacuation of which permitted the prompt and rapid recovery of muscle power. It occurred to me then that this pathological middle ear process might explain many of the cases of Bell's paralysis ordinarily described as "due to cold" and a further study of the subject during the past two years has only served to strengthen that conviction.

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[1]The Johns Hopkins Hospital Bulletin, April, 1902, Vol. XIII, p. 83.

A very brief investigation of the literature showed me that while this idea was at variance with the popular text-books it was not entirely new, but, though many writers have recognized the possibility of a relationship between facial paralysis and otitis media, no one has, so far as I am aware, claimed the broad general connection between the two affections that I hold does probably exist. Bennard and Deleau[1] each pointed out the possible dependence of facial paralysis upon catarrhal otitis as early as 1857 and a number of writers have since reported cases illustrative of this relationship. Tomka, especially, in a very excellent article[2] dealing fully with the subject of Facial Paralysis, emphasizes this point and reports additonal cases. Politzer[3] says: "That Facial Paralysis sometimes occurs even in cases of simple, non-perforative catarrh has been proved by the observations of Wilde, Von Troltsch, Tillman, Politzer, etc." Baerwinkel,[4] says that "the disease is always accompanied by an affection of the middle ear; the lighter ones with a serous, quickly absorbable exudation, and the severer forms with a plastic exudation."

Erb, in Ziemssen's hand buch der Spec. Pathologie, and O. Berger, in a special Article on the "Pathology of Rheumatic Facial Paralysis"[5] gives expression to the same views.

In English I have found practically nothing upon the subject, except in a few reports of cases. In an article on the "Relations of the Facial Nerve to the Tympanum, especially in Tympanic Exenteration," Randall[6] incidentally deals with this question and seems to lend his support to the theory I have expressed. There is a sur-

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[1] Paralysie du nerf faciale, etc., Paris. 15pp. 16°, 1858.

[2] Archiv. f. Ohrenhlk., April 1900.

[3] Text-book on Diseases of the Ear, 4th edition, 1903, p. 477.

[4] Deutsch Archiv. f. Klin. Med. 1867, 14 Bd., S. 122.

[5] Deutsche Med. Wochen., Dec. 9, 1876.

[6] The Laryngoscope, June, 1902.

prising absence of reference to the matter in the text-books upon Otology. No one of those in common use does more than barely refer to the possibility of this paralysis being associated with acute tympanic disease. Richards has called attention to the very scant consideration given by aurists to this important nerve, but in speaking of its paralysis, even he, referred only to those cases due to operative traumatism or to necrosis in suppurative otitis.

It is extremely interesting to turn to the text-books upon Neurology and upon the Practice of Medicine and to note the unanimity of opinion and similarity of expression concerning the etiology, prognosis and treatment of facial paralysis, and, to mark the almost complete absence of anything like a satisfactory statement of its pathology. It would require too much of your time to read you quotations from even the principle ones of the text-books I have consulted. The list includes such well known works as Dana's Text-Book on Nervous Diseases; Starr's Organic Nervous Diseases; Mayer's translation of Oppenheim; Nervous Diseases by American Authors; Clifford Allbutt's System of Medicine; The Encyclopedia Medica; the Practices of Medicine by Osler, Wood and Fitz, Salenger and Kaltyer, and Adolph Strumpell.

In the way of a brief analysis, I may say that they are agreed upon the percentage of cases supposed to be due to exposure to cold and upon the line of treatment to be followed; that, with one notable exception, they offer no better explanation of the pathological process involved than might be embodied in the statement that—the lesion is a neuritis, resulting from the effect of cold upon the nerve trunk or its terminals; that, all who describe the prodromic symptoms make some reference to the ear —several saying that the palsy is usually preceded by pain in the ear, tinnitus aurium and, occasionally, fever and nausea—yet none seem to consider that this reference has any bearing upon the pathology of the disease.

All of the recent writers upon the subject seem to have accepted the statistics offered by Philip and Heubschmann as presenting a fairly accurate subdivision of the cases of Bell's palsy, according to etiology, i. e., that about 3% are of syphilitic origin; 5 to 6% of a traumatic nature; 6 to 9% due to otitis media; and, that from 72 to 75% are caused by "exposure to cold." This last large group is usually spoken of as the "rheumatic" or "refrigeratory" type. Curiously, while this group embraces about three-fourths of all the cases of facial paralysis observed, it is the group about which we possess the least positive knowledge. The process of involvement of the nerve in the syphilitic or traumatic cases and in the otitic cases, where necrotic invasion of the Fallopian canal can be directly traced through a chronic suppurative otitis media, is perfectly clear. But what is the nature of the disease process involved in that large collection of cases included under the heading "refrigeratory facial paralysis"? To state, simply, that a disease is produced by exposure to cold, does not give one a very clear notion of its pathology nor does the additional declaration that it is rheumatic in character help in the slightest degree to explain the nature of the lesion. The term "rheumatic" has lost its power as a conjure word and modern pathology demands something more satisfactory.

In reading the authorities named above, it is quite evident that wherever they have mentioned otitis media as a causative agent in facial paralysis they had in mind only that comparatively small group of cases attended by a suppurative, necrotic, middle ear disease. It is equally clear that while all attributed the majority of cases to "exposure to cold" but one had any explanation to offer as to the mode of action of this agent. Since they refer explicitly to the suppurative otitis cases and do not here mention the tympanic route of exposure, or, in some few instances, ridicule the possibility of the nerve being so

easily affected in this part of its course, it is to be inferred that they all believe that the cold produces its destruction by direct action upon the nerve terminals or the trunk after it emerges from the Styloid Foramen. Upon what pathological basis can this idea rest? Undue exposure to cold may irritate a mucous membrane and readily cause its inflammation, but certainly the skin and its underlying tissues do not succumb easily to such influences. From the point at which this nerve leaves its bony canal to its finest endings it is for the main part buried in the soft tissues and protected by the skin; in fact, its protection is far better in this region than while passing through the Fallopian canal. Nor is there any analogous condition of a nerve so well covered suffering paralysis from the effect of similar influences exerted upon the covering tissues.

A proper pathological study of this affection by the usual methods is not very promising. It is not at all probable that any number of cases will ever come to a scientific post-mortem investigation. In the vast majority of cases the prognosis for recovery of function is good. None are fatal, and, when death occurs to such patients from an inter-current disease, there are many possibilities of failure to secure a valuable study of the nerve lesion. There have been three autopsies recorded of cases of peripheral facial palsies and it will be worth our while to make a careful review of these histories. The anatomical findings, in a microscopic study of the nerves, were the same in all cases and consisted in a true degenerative inflammation of the nerve fibres, with disintegration of their medullary sheaths, but no involvement of the interstitial substance; a parenchymatous and not an interstitial or general neuritis. The inflammatory destruction was always most intense in that portion of the nerve which had occupied the Fallopian canal, spread peripherally with somewhat lessening intensity, and, when traced centrally, showed in the nucleus or any portion of the

nerve central from the Fallopian canal only such changes as belong to secondary degeneration from peripheral nerve injury. From the fact that the outer sheath of the nerve and its interstitial substance are supposed to have been healthy in all of these cases it has been inferred that the lesion could not have extended from disease in the neighboring structures in the tympanum and several of the authors referred to above have used these pathological findings as arguments against the possibility of such an origin for the neuritis. It is needless to say that such argument is not truly logical. It would seem perfectly possible to have an injury to this nerve from excessive prolonged pressure within the confined space of the Fallopian canal, where the delicate nerve fibres would suffer while the more resistant structures of the sheath and interstitial connective tissue escaped damage. Neurologists recognize a "pressure palsy" as possible to any other nerve in the body and the pathological picture is that of parenchymatous neuritis.

In the second place it must not be forgotten that it is never safe to consider any disease from one point of view only. Very rarely, indeed, can you take up a pathological specimen in the laboratory and from a study of the lesion, construct the true clinical history of the patient from whom it was obtained. Just as frequently will you fail at the bedside to determine the exact nature of the anatomical lesions which will be discovered at autopsy. The three cases I have referred to have been quoted widely as more or less typical cases of refrigeratory facial paralysis and great stress has been laid upon the character of the nerve changes, but, so far as I have seen, no one has at the same time given consideration to the clinical features of the cases. I have given you the morbid anatomy, let me place beside that the clinical histories of these cases and I am sure you will draw different conclusions than those I have spoken of. I should not consider either of them as typically "refrigeratory",

yet, if the neurologists insist on so pronouncing them, it will certainly fortify my position as regards the mode of production.

The first case was reported by Minkowski[1] and a synopsis of the history is here given. A woman, 52 years of age was suddenly attacked by a giddiness and fatigue of such severity that she had to go to bed. In the course of two hours she complained of loss of power over her right arm and right leg and it was noticed that her speech was impaired. When Minkowski saw her, two weeks later, there was complete facial paralysis of the right side. Four weeks after the beginning of the illness, the condition of the arm, leg and face remaining unchanged, she lost the power of speech completely. Death occurred from an attack of pneumonia, some weeks later.

From the clinical standpoint this would appear much more like a central than a peripheral paralysis.

Of the second case, reported by Darkschewitch and Tichonow[2] the following is a summary: A woman, 59 years of age, became ill in March, 1892, with an acute inflammation of the middle ear, which followed rapidly upon an acute cold. Complete deafness and a purulent otitis media of the affected side resulted. In July she developed mastoiditis on the same side, an operation was performed, and several days later total paralysis of the facial nerve appeared. At the same time, panophthalmitis developed in, and destroyed, the corresponding eye. She died in the following February of an erysipelatous inflammation of the face. In addition to what I have said of the post mortem examination it is worthy of note that the authors themselves, say that the evidence pointed to the probability that the changes in the nerve structures started in that portion which rested in the

[1] Arch. f. Psych., 1890, Bd. XXIII, p. 367.

[2] Neurol Centralbl., 1893, p. 329.

Fallopian canal. What evidence is there that this is a case of refrigeratory paralysis? It was clearly due to one of two things, infection or injury; if the latter, it may have been directly traumatic at the time of the operation or the result of pressure from inflammatory exudate. Some of the writers have spoken of this as a case of otitic origin and yet, while the nerve sheath was found intact and the interstitial substance healthy in this as in the other cases, deny it any value in supporting the theory that the otitis can be an important factor.

The third case is that of Dejerine and Theohari.[1] An old woman who had long been the victim of uterine cancer was suddenly attacked by Herpes Zoster and a few days later facial paralysis appeared on the same side. There is no history of other disease nor of unusual exposure. The authors attribute the palsy to the attack of herpes and explain it as an "infectious process, the nature of which has not yet been determined." Could there have been an intermediary otitis here? It is quite possible. The typmanum is sometimes affected in Herpes and Hartmann is said[2] to have observed the true vesicles on the tympanic membrane.

It is to be remembered that the pathological findings were the same in all three cases and yet the clinical pictures differed widely. The first is apparently a case of paralysis having its origin in some cerebral lesion; the second is undoubtedly of otitic origin while the third is doubtful.

I have previously referred to one exception to the general view taken of the pathology of this affection, and here I would like to quote Dr. Herter's opinion, as expressed in his article in Nervous Diseases by American Authors.[3] "Neuritis of the facial nerve is the cause of a very large proportion (probably more than 80%) of all

[1] La Semaine Medicale, 1897, p. 453.

[2] Politzer's Diseases of the Ear. 4th Ed., 1903, p. 193.

[3] Edition of 1895, p. 822.

cases of peripheral palsy. The neuritis is commonly called "rheumatic." Whatever that may mean, it is true that the palsy generally comes on after exposure to cold. Occasionally the subjects are distinctly gouty or rheumatic but usually there is no evidence of either condition. It was formerly thought that exposure to cold caused facial paralysis by paralyzing the terminations of the nerve in the facial muscles. There is now good reason to believe that the affection always depends upon an inflammation of the trunk of the nerve (perhaps involving chiefly the sheath) within the Fallopian canal, and there is no evidence that inflammation ever involves the nerve after it emerges from the canal."

In the absence of a definite determination of the morbid anatomy of any disease we are justified in, and must depend upon, its study from two points of view: first, the vulnerability of the affected tissue considered anatomically and histologically; second, the clinical features presented in a large number of cases.

Stated as briefly as possible, the anatomical course of the facial nerve, after it leaves the cerebral cavity is as follows: the Fallopian canal commences at the internal meatus, above the place of entrance of the auditory nerve; it then passes externally above the vestibule into the substance of the petrous bone and arriving at the inner tympanic wall turns backward and proceeds along this wall above the fenestra ovalis to the junction of the posterior and inner walls, where it takes a sudden curve downwards to end at the stylo-mastoid foramen. Until it reaches the inner tympanic wall the nerve is surrounded by the thick petrous portion of the temporal bone and after it leaves the styloid foramen it is well protected by the soft tissues of the neck and face. The most vulnerable point, therefore, is to be sought in that portion which rests in the Fallopian canal with its tortuous course about the tympanum. In the bony wall of this canal there are normally, in adults, two constant openings; a

small one on the *eminentia pyramidalis* for the passage of a branch of the nerve to the stapedius muscle, and, the *Aqueductus Fallopii*, just behind the annulus tympanicus, through which the chorda tympani enters the drum. One does not have to tax his imagination severely to conceive that infection may at times reach the nerve from the tympanum through these channels, but, a little closer study will show the frequent existence of even more favorable modes of entrance than these. Politzer is authority for the statement that "that portion of the canal which traverses the tympanic cavity sometimes presents dehiscences of varying sizes" and all otologists will accept that much as true. But, where and how often may these dehiscences be found?

Tomka[1] says that the Fallopian canal over the eminentia pyramidalis is naturally thin and frequently shows openings and that here the covering of the nerve is in immediate contact with the mucous membrane of the middle ear. He also quotes Zuckerkandl as having said that there is very commonly a fissure in the canal wall just above the oval window, probably intended for the passage of the stylo-mastoid artery. According to Henle the facial nerve is frequently exposed in the canal or is covered only by a fibrous membrane as in the lower animals. Embryologists tell us that the Fallopian canal in the embryo is composed of a membranous open canal or gutter which later becomes closed by ossification. The dehiscences come to exist as the natural consequence of any interruption to this process of bone formation. I have seen no statistics showing the frequency of the openings in the canal wall nor their variation in size. Through the kindness of Dr. B. Alexander Randall, I was recently permitted to examine his private collection of temporal bones and also the magnificent specimens at the Wistar Institute of Anatomy. It is a difficult matter

[1] Archiv. f. Ohrenhlk. April, 1900.

to inspect the canal wall in the uncut bone and, for want of time, I made no effort to study these specimens accurately nor to make measurements. A rough examination of over 300 temporal bones, though, fully convinced me that a perforation of some degree exists in probably one half of the normal specimens and that the opening is most commonly situated above the oval window.

From the clinical point of view the argument is much more simple and direct. It is admitted by all that when prodromic symptoms are noticed they almost invariably include mention of the ear, if they are not restricted entirely to that organ. These symptoms are variously described, as, pain in the ear, that being the most frequent one, slight deafness and stuffiness, tinnitus aurium, tenderness behind the auricle, or, earache accompanied by a slight rise of temperature and nausea or vomiting. Generally these are but transient symptoms and the paresis makes its appearance within a few hours or at most two days. One will naturally ask why the ear complications have been so generally overlooked if they are so commonly present and why facial paralysis is not of much more frequent occurrence than it is, since acute or sub-acute otitis media is such a common affair. My conception of the mode of production of a facial paralysis from exposure to cold, is, that something like the following occurs: The patient may be in apparently perfect health but through exposure to cold in some way, a draft, a cold wind, or emersion in cold water, acquires an acute otitis media, which may be of a simple catarrhal nature through vaso-motor changes, or which may be the result of an active microorganism taking advantage of the temporarily lowered local resistance; in either event there is an inflammatory swelling of the mucous membrane and a pouring out of an exudate into the tympanum. If there be any break in the facial canal wall, no matter how small, sufficient to permit the entrance of fluid or of pathogenic bacteria, there exists the opportun-

ity for the direct extension of inflammation to the nerve or for compression of the nerve in its confined channel. We all know that there are probably always bacteria present in the mouth and nose which can play an active role when the occasion is afforded and, furthermore, that catarrhal otitis media of a mild degree is by no means rare. As a general rule these middle ear inflammations are not troublesome, cause very little disturbance and pass away without treatment. In the majority of instances where the facial nerve becomes involved there is only a paresis, or a complete paralysis which rapidly disappears, and function is restored as the local tissues regain their normal powers of resistance and the mastery of the situation. The patient rarely mentions in these cases of paralysis, the preceding ear symptoms because they have been so mild or attracted so little attention that when he became absorbed in the consideration of his more alarming condition, the facial deformity, he forgot the preceding disturbance.

This certainly coincides with my clinical experience. Since I first spoke of this matter at the Johns Hopkins Medical Society, Dr. Henry M. Thomas, Chief of the Neurological Department, has kindly given me the opportunity of examining such cases as have entered his service in the Dispensary and in every instance I have found pronounced evidences of middle ear involvement. The constant coexistence of these affections appears to me to be more than mere coincidence. Necessarily, the number of cases I have studied is very small, but I have the records of 12 cases in which the diagnosis of refrigeratory facial paralysis had been made by perfectly competent observers. In not a single instance did the patient voluntarily tell the physician of any preceding or existing ear trouble. In ten cases, the patient recalled the fact that the ear had given some discomfort shortly before the paralysis of the face appeared; the precaution was taken, of course, not to ask

leading questions. In four cases the aural discomfort still persisted but its existence was ignored by the patient because of his deeper concern in the facial deformity. But, regardless of the subjective sensations there was positive objective evidence of ear disease in all of the cases. I refrain from reading the clinical histories of these cases, lest I bore you beyond endurance, but I must call attention to some of the variations in the tympanic picture. In but one case was there an acute inflammatory condition of the membrane and that case was observed on the day following the onset of the palsy. In the others there existed the picture of a sub-acute or chronic catarrhal process. The period of longest delay between the paralysis and the inspection of the ear was seven months. In four of the cases there was the appearance of fluid in the tympanum and paracentesis proved the correctness of the diagnosis; once this secretion was purulent. One of the most recent cases I have seen presented such an interesting middle ear condition that I would like to speak of it more fully. The patient was a woman aged 34, who came in with a left facial paralysis of seven months' duration. When asked if she had ever had any ear trouble she stated that she had suffered some pain in her left ear just a few days prior to the paralytic attack and that she had been deaf ever since, on that side. Inspection of the ear showed a dull, apparently thickened membrane with no light reflex. There was a very marked loss of hearing for low tones and an increased Weber on that side. Although the period of delay had been very long I advised paracentesis and the operation was performed by my assistant, Dr. Edwin H. Schild, who reported to me that when the knife punctured the membrane he felt as if he were cutting through a doughy substance. I examined the case with him later and through an enlarged opening we could clearly determine that the tympanum was partially filled with a firm clot of blood which was certainly not of re-

cent origin. By frequent irrigation, Politzerization and the use of absorbents, the clot was removed and within a few days there was marked improvement in the facial condition. The patient has recovered full hearing power and the paralysis has almost entirely disappeared. This is the second instance in which I have encountered a semi-solid exudate in the tympanic cavity.

From what I have said it logically follows that the treatment of facial paralysis of this type begins with proper attention to the ear. If this be instituted promptly a successful result may be looked for; the longer it is delayed, the worse the prognosis. While the general practitioner and the neurologist have failed to recognize this in the proper way and to the full extent, they have been to some extent on the right track. The treatment which seems to have been agreed upon by all the authorities as most beneficial is: the application of leeches over the mastoid, counter-irritants behind the ear, purgatives, and potassium iodide internally. These are precisely the remedies of most value in removing inflammatory products from the tympanic cavity—except, the employment of instrumental aid. The point I would make is that they have not gone far enough in the direction of ear treatment. They have been employing half way measures when a simpler, more complete and more promising remedy is at hand. Paracentesis of the tympanum is certainly not a serious or difficult operation, it can do no harm and I assure you that it may do a great deal of good and do it promptly in these cases.

General recognition of the true pathology of Refrigeratory Facial Paralysis and the necessity for prompt aural treatment is a matter of great importance, and I have called attention to this matter, and presented the argument as forcibly as I can, because I look upon this affection as one that has not received the consideration it deserved, as one that is susceptible of successful treatment when it is instituted in the proper

way, but one that if neglected or improperly treated leaves a sad affliction in the shape of a deformity that cannot be hidden, and, as a disease the pathology of which requires clearing up. I shall feel amply repaid if this paper or any discussion that may arise from it, succeeds in forcing those who see these cases first to study more closely the accompanying aural conditions. To the otologist the matter may be of interest from the fact that if it be true that there is commonly an aural complication it brings into our field another large class of cases for consideration and treatment and as it is our duty to guide the general profession in matters pertaining to otology it behooves us to give this matter some further attention.

DISCUSSION.

Dr. Richardson:—This interesting specimen of Dr. Berens is truly one of great value as showing the possibility of injury to the nerve in this course which it sometimes takes.

The paper of Dr. Reik's is most interesting and a very timely one. It calls attention to a subject that has been largely overlooked by neurologists and general practitioners, and also to the fact that these cases occasionally cause the otologist trouble. In the paper of Dr. Richards referred to by the essayist I called attention, in the discussion, to the possibility of these cases coming into our hands, and spoke of one that gave me considerable annoyance for the time being. It was a case of the refrigeratory type of palsy, which was unfortunately not noticed until three or four days after the patient had been under my observation and the patient concluded, of course, that the treatment which I had instituted was the cause of the palsy rather than the otitic condition, which was the direct factor. He left me on the second day after the palsy developed, and it was only through the support of

the general physician and the fact that the palsy subsided that I was saved from having legal complications. I have seen quite a number of these cases of facial palsy, which have all dated from a pre-existing catarrhal condition of the middle ear cavity, and there is no doubt from the clinical history that all these cases that I have seen were caused directly by the catarrhal condition. In my own city we have two very marked and disfiguring cases of facial palsy which were directly due to middle ear catarrh. They have the unmistakable history and the changes in the ear, with marked deafness.

Dr. Blake:—I was interested to hear Dr. Reik's percentage of the small openings. The larger openings on the posterior wall of the cavity are only about 3%. The larger openings are accountable for the vegetative palsy which we get in cases of middle ear trouble. As to the pressure symptom, I had just before coming away a case of palsy of five days' duration in a mastoiditis that came to operation, and from this case I hope to have a further report tomorrow. It is distinctly illustrative of the pressure factor. For a distance of three or four millimeters in there was sclerosis. Then from a small cell in the posterior portion there came pus, exuding under considerable pressure. Deeper chiseling showed that the cell was one of the termini of a series connected with the antrum. The mastoid was cleared out and the case left without any other expectation than that the facial palsy being a pressure symptom would begin to clear up within twenty-four hours, and in that length of time after the operation there were signs of returning activity.

Dr. Leland:—This specimen of Dr. Berens shows the hopelessness of always being able to tell from the texture of the bone where the Fallopian canal lies. In following deeply carious or markedly inflammatory bone it is sometimes necessary to lay bare the horizontal semi-circular canal in the floor of the antrum, or even the dome of the vestibule beyond it, the white hard bone of these struc-

tures showing out plainly in contrast to the more porous, vascular bone in which they are imbedded. On about the same plane and in front of this semi-circular canal, also surrounded by porous bone, should be found another white bony tube—the Fallopian canal; but in this specimen there is no such delimitation, the whole structure being eburnated; and the unusual course of this canal leading outward at an angle of something like 15° from its proper course would make nerve injury exceedingly liable, and hence expose the patient to marked disfigurement and the operator to legal complications.

Dr. Jack:—This anomalous course of the facial nerve seems to be a possibility, and we should suspect it in our cases. This spring I had a case in which the course of the nerve took nearly the direction shown in Dr. Beren's case. There was no post-mortem, but there was considerable exposure of the nerve at the time of operation and for a long distance at least it had no hard bony covering. I exposed it for a half inch and picked it up with my forceps. It showed not only an anomalous course, but also that it had no hard bony covering. There was a slight facial paralysis that persists at the present time.

Dr. Randall:—I feel that I should speak of Dr. Berens' specimen since, in a paper read before the Society last year, I attacked the idea of the occurrence of these anomalies, and I therefore commend at once the contradictory demonstration afforded by Dr. Berens' preparation. On the other hand, I think it must still be remembered, as I said in my paper last year, that our only criterion for determining the true course of the facial nerve is a knowledge of the planes of the head. It is not possible for us to have this knowledge in dealing with the isolated specimen; and this might still represent an almost vertical course if studied in connection with the head, because the auditory canal can run at an angle of twenty degrees up and in and possibly more, as I have demonstrated. (Tr. Am. Otol. Soc.) The relation, therefore, can be

better defined in the living and in our operations than in the isolated specimen in this way. We can locate the oval window and the facial canal above it and then determine what should be the vertical line of the descending portion. So that I think this specimen is more striking in appearance than in fact if we could demonstrate the exact planes of the head and the degree of obliquity, if any, it actually showed. That it was a clinical obliquity and a dangerous relation to the back wall of the auditory canal is, of course, beyond any question.

With regard to Dr. Reik's paper, I am rather chagrined to find how indefinite my own writings on the subject have been. The matter of these refrigeratory attacks of facial paralysis, so-called, was brought home to me in my earliest medical duties, and quite early in my membership in this Society (I think in 1888) we had a paper by Dr. Holt of Portland, dealing with this subject and putting forward as clearly I think as has been done even yet (although not *in extenso*) the relation of these attacks to tympanic inflammation. I therefore have assumed it rather than explicitly dealt with it in my writings on the subject.

The neurologist takes the ground generally that the point of exit of a nerve from its foramen is its most vulnerable point, that it is most easily injured there by rheumatic swelling of its sheath, and they are therefore inclined to ascribe these "Bell's Palsy" attacks to trouble at the stylo-mastoid exit. I have seen such cases, one in a colleague, and in spite of the fact that there was tympanic suppuration at the time, they have seemed from their clinical history to be such from the extreme tenderness just at this point with no traumatic evidence and no exacerbation of the tympanic symptoms. This leads me to believe that we can have, even in some cases where the probability is strong of tympanic trouble, a peripheral involvement of the nerve. I have seen a case in a child with some degree of facial paralysis when I first saw him

and with a polypoid filling of the canal. In operating for the removal of the polypus I felt for the origin of it and encountered a minute spicule of bone loose in the oval window region. I removed it, expecting to have the incus or something of the sort; but found that I had removed one crus, the head and half the foot-plate of the stapes. The case had once before been operated upon or investigated by a colleague and it is possible that traumatism had been done then; I had done nothing to dislocate or fracture it. I supposed that there we had, of course, an involvement of the nerve above the oval window; but there was present an adenitis of the glands in the aural region and the facial paralysis declined and rose entirely in accord with the adenitic condition outside. The glands went on to suppuration and had to be curetted out; and with the recurrences of the anterior trouble there was involvement of the facial nerve more pronounced and waning again with improvement of these symptoms. So we could certainly put these down as involvements of the branches rather than the trunk. I have seen other such cases in relation to neoplasms of the parotid region. I had an illustration, not long since, of the occurrence of facial paralysis in relation to haemotympanum. A youth was hurt in a football game and his hearing was found to be immediately defective. Examination that evening showed filling of the drum cavity with a dark fluid and during the night the facial paralysis developed. It cleared up in about two weeks; but the trauma has permanently damaged his acoustic appartus.

I think the point has been well made by Dr. Leland, as to the texture of the bone about the nerve, because it was brought to my notice in a medico-legal case where the nerve had been injured in a radical mastoid operation, and I was put upon the stand as an expert. The point had been made by another expert that the texture of the bone could and should always teach the operator to avoid the nerve. I believe that is impossible in the

adult and so said; and I believe most of you will bear out that statement, that it is not possible to prevent the occurrence of injury by recognizing differences in the texture of the bone.

As to herpes, as spoken of by Dr. Reik. I have seen few cases of true aural herpes, but when these cases do come they come in a lump; I had three at one time—two of them husband and wife—and the question arose as to whether there was a directly infectious element. In each of these cases there was middle-ear involvement, so that I think that has a bearing in the matter. The point is one that has always interested me and I am glad that it has been so well and explicitly handled by Dr. Reik, as it certainly deserves to be put clearly upon record and I hope that his paper will be published in full and illustrated by such pictures as I believe he contemplates using.

Dr. Berens:—I would thank Dr. Reik for calling attention to the subject of his paper and for making it so plain. The older writers fell into the mistake of calling these attacks rheumatic because the rheumatism in the vast majority of cases shows itself by an exudate of a catarrhal nature in the middle ear. So their treatment was of considerable value, even though they did not treat the middle ear.

As to Dr. Randall's remarks on my paper, if I remember correctly last year in his paper he said in regard to the course of the nerve that by holding the specimen with the nerve in the vertical position you could thereby get the proper position of the specimen in the skull. The vertical position in this bone is represented by the pin inserted into this small rudimentary canal. It really is nothing but a sulcus, but was distinct enough to enable me to insert the point of the pin. That represents then the vertical, whereas if we place the canal vertical we would put the patient's head in a position of wry-neck. So that I think that this nerve is absolutely atypical, in spite of

any possible developmental changes, or in spite of the possibility of error from its being an isolated specimen from the cranium. The point is that while the relationship is perfect as to canal, foramen ovale, etc., in order to reach the nerve at that point of relationship, we would surely injure it in getting to the mastoid cells or antrum. It would be practically impossible to uncover that point of relationship that we all look for, the semi-circular canal, without cutting down and impinging on it, and, if this nerve were one without a bony covering at one exposed point, we could not tell whether we would cut down on it or not and the chisel or curette could slip in upon it and the result would probably be a permanent facial paralysis.

Another point is that the nerve illustrates the danger of operating by taking off, as I have seen done, with a broad chisel the whole external table of the mastoid process where we have a right to expect that it is lying free. If that were done here we would certainly tear this nerve.

The whole relationship here is shown very clearly and I should like to demonstrate the specimen to each one of you.

Dr. Randall: — I should like to ask if Dr. Berens has any idea as to the configuration of the cranium from which this specimen came?

Dr. Berens: — Not the slightest, because it was simply a bone brought from Vienna.

Dr. Reik: — I am pleased that the position I have taken has met with the approval of the members. In talking the subject over with the neurologists and medical men I have been surprised at their position regarding the pathology of the condition and I desired to make sure I was right from the otological standpoint.

Dr. Randall spoke of the possibility of herpes being due to infection. The latest work along this line tends to prove, I think, that it is always so.

TINNITUS AURIUM. DIAGNOSIS AND DIFFERENTIATION.

W. Sohier Bryant, M. D., *New York, N. Y.*

In order to treat tinnitus intelligently, its causes must be systematically differentiated, and a careful analysis made in each case. The diagnosis is based on the admission of the patient, and is nothing more than a differentiation of the usually complex symptoms. The patient describes his subjective sensations, and the doctor analyzes them, selecting all that fall under the definition of tinnitus. The presence of subjective tinnitus is alone dependent on the sensations of the patient while that of objective tinnitus is confirmed by auscultation of the patient's ear and its neighborhood.

At first the patient refers the source of the tinnitus to some external object, and it takes some time before he discovers the deception. He may be misled by the tinnitus at intervals for years. Sometimes he thinks the tinnitus is an external sound, and sometimes he mistakes a similar external sound for the tinnitus. The patient refers the sound to the ear or various parts of the head, or he may perceive it as coming from outside his head, in a constant or varying direction. The tinnitus is usually heard in the ear itself or in some part of the head, such as the occiput temporal region, or vertex. It may appear to proceed from every part of the head at once, or from a certain spot. It may be a constant noise or it may vary in character and intensity as well as intermit. There may be several different sounds at once, or there may be sudden violent exacerbations like explosions. When voices are heard they are usually projected outside

the head in some definite direction, independent of the position of the patient's head. They may be clear or indistinguishable, and of one person or many. The determination of the variety and source of the tinnitus is of great value for prognosis, and for an indication of the treatment. The nature of the tinnitus when present is the determining factor in forming the character of the delusion in the insane, inebriates and in any psycopathic state.

The examination of the patient should determine the following facts in order to give sufficient data to form an accurate diagnosis and prognosis:—The patient's age. The duration of the symptoms. Whether the onset was sudden or gradual. Whether the symptoms are unilateral, bilateral, varying or alternating, and which ear is affected if they are unilateral. Whether the tinnitus is insignificant, endurable, very troublesome or unendurable. Whether the symptoms are objective or only subjective. Whether they are constant, intermittent, remittent or pulsating. If there are variations, note whether they are regular or irregular, and by what caused and with what coincident. Whether they are increased or decreased by diminished or increased blood pressure in the head. What effect does compression of the various vessels in the neck as the carotid, vertebral and jugular have? Is the tinnitus heard loudest or least at any particular time of day? Does holding the breath influence the tinnitus? What effect does inflation of the tympanum by Valsalver's method have on the tinnitus? Is it increased or decreased by tones of high or low pitch? By external sounds or stillness? Is it increased by alcohol, tobacco, tea, coffee, salicylates, quinine, etc., or by over eating? By mental excitement or muscular exertion and by nervous exhaustion? Do position or movements of the patient affect it—as lying down, stooping or standing? Is the tinnitus affected by movements of the voluntary muscles, the facial, deglutitory, cervical or entotic?

Does closure of the external meatus increase or decrease the tinnitus? Note whether the tinnitus is caused by pressure with the finger on the course of the fifth nerve, by pressure on the mastoid process, irritating the skin in the region of the ear, rubbing or shaving; or by reflexes from the teeth, and buccal or nasopharyngeal mucous membrane. Is there any history of systemic disturbances, constipation, rheumatism, atheroma, syphilis, tuberculosis and gout; or is the tinnitus the sequel to any systemic intoxication or cachexia? Is it a definite noise? To what sound can the subjective sound be compared—if any? Is the tinnitus a combination of different sounds? Is the character of the sounds constant or varying? Is the tinnitus a succession of sounds—and if so—are they regular or variable? Is it a musical note? If so, what is its pitch? If it is a noise what is its fundamental tone? Note the pitch of the tinnitus when possible, by comparing it with sounding bodies—piano or tuning fork. Is the tinnitus the sound of voices, and if so are these indistinct or clear, and what is the character of the conversation and by whom spoken? Are there appropriate visions with the voices—do people at a great distance appear and utter words? Note whether the words are perceived in any special part of the head and where? If they appear to originate outside the head note their direction. Test the hearing. Note the kind of defect in hearing if there is any present, making a diagnosis of the conditions in the ear affected. Note the functional condition of the nasal respiration. Examine the nasopharynx before and after application of adrenoline. Examine the fossae of Rosenmuller with a bent probe or the finger, to feel if it is occluded or free. Examine the nares, anterior and posterior. The diagnosis of the local conditions is made by an aural examination as in cases of simple deafness:—inspection of the membrana tympani before and after inflation with the air douche or catheter and during the use of Siegle's speculum. Note the patency

of the Eustachian tubes; and how the tinnitus is affected by the inflation. Also note if the tympanum is free or not from pathological contents, adhesions and cicatrices.

The relation of the source of the sound and cause of its perception can be easily determined in tinnitus due to fluid in the tympanum or clogging of the meatus, and also in cases with snapping of the Eustachian tube, respiratory sounds or circulatory sounds. In adhesive otitis the circulatory sounds become clear arterial pulsations. Motion of the drum membrane when the tensor tympani contracts may make a rubbing sound, ending in a roaring when the muscle is tense. The stapedius causes a high note, clicking, etc.

Tinnitus may exist without any disease of the ear in the reflex and external forms, and in cases where its origin is central.

Spaulding emphasizes the importance of recording the pitch of the tinnitus. He says that if a sound corresponding in pitch to the tinnitus is agreeable to the patient, labyrinthine disease is indicated, and if it sounds harsh it indicates disturbances in the conduction mechanism. Record the pitch and character of the sounds as definitely as possible, for an indication of the probable cause of the disturbance and in this way also any subsequent changes can be more accurately described than by trusting to the patient's memory alone. A piano is more serviceable for this purpose than tuning forks unless the patient is very deaf.

It is the rule rather than the exception that various forms of tinnitus occur in the same patient. Conduction tinnitus is often combined with the other forms and is usually the most important factor in causing the disagreeable sensations of the patient.

Bilateral equal tinnitus indicates a constitutional cause, while bilateral tinnitus differing in the two ears indicates a local cause.

Loud tinnitus coming on suddenly depends on:—apo-

plexis in the auditory tract, acute affections of the labyrinth, central trauma, sudden effusion of the tympanum, or acute closure of the Eustachian tube.

The differentiation of sound conduction tinnitus from tinnitus of the inner ear is made by the presence of low pitched sounds mingled with the high. The high subjective sound indicates direct stimulation of the labyrinth by the sound impulses abnormally reflected in the labyrinth. The sounds are high pitched in fixation of the stapes. The pure high pitched sounds are usually due to disturbances of the perception mechanism of the labyrinth, therefore the pitch of the auditory sensations gives the clue to their origin in the middle or inner ear. Electricity has been used with success in making a differential diagnosis between tinnitus arising in the perception mechanism and tinnitus due to the faulty action of the entotic muscles—using the faradic current for the muscles and the galvanic for the nerves, and applying the positive pole to the ear. The muscular tinnitus is lessened by the faradic, and the nerve tinnitus by the galvanic.

A foreign body—as impacted cerumen—may cause the sensation of human voices and cries of animals in a psycopathic patient. These sounds may also be due to central irritation, which must be the case when there is absolute peripheral deafness. Voices and musical tinnitus indicate a central lesion or cortical irritation, and hallucinations of hearing (articulate speech or melodies) do not occur without a changed functional condition in the brain. If in disease of the brain musical tinnitus is added, an organic disease of the central acoustic tract is indicated. Loud tinnitus without impaired hearing suggests central lesion. Subjective sounds appearing after loud external sounds indicate only a disturbance of the perception apparatus in general, and have no connection with the last mentioned conditions.

The tinnitus when occurring with impaired hearing can

be assumed to have arisen from the same cause as the defect of the hearing, till the assumption is contradicted by further observations.

(1). *Objective tinnitus* is obviously present when the observer is conscious of the sounds complained of by the patient. This occurs when the sound vibrations are loud enough to be heard by the observer. It is called (A) *Vibratory Tinnitus* and when the sound vibrations arise outside the ear they form, (1) *External Tinnitus*. (a) *Vascular Tinnitus* is present when circulatory sounds, either arterial or venous, are heard on oscultation of the patient's ear, or its neighborhood, and when the patient complains of an intermitting or remitting tinnitus, synchronous with the pulse, or of blowing sounds due to a venous murmur. The sounds are influenced by changes in the caliber of the vessels, produced by digital compression and by physiological dilatation, and increased tension following violent exercise or hearty eating. (b) *Pharyngeal Tinnitus* is present when the pharyngeal sounds that can be heard by the doctor are complained of by the patient. They are sticky mucous sounds—ticking, clicking and snapping, also friction sounds in dry pharyngitis, caused by the movement of the pharyngeal or cervical muscles. These sounds are commonly connected with the physiological movement of the pharynx, or they may be due to spasmodic movements. (c) *Respiratory Tinnitus* is present if the patient complains of sounds which cease when he holds his breath. (d) *Muscular Tinnitus* exists when the symptoms are dependent on the movements of the cervical or other muscles, especially the masticating muscles. Snapping of the interarticular cartilage is the commonest cause of this tinnitus. Not infrequently *Pharyngeal* and *Muscular Tinnitus* occur in combination.

(2) *Internal Tinnitus* is present when objective sounds originating in the ear itself are noted by the patient. (a) *Salpingeal Tinnitus* is due to the objective sounds arising

in the Eustachian tube, and it depends usually on the physiological act of opening the tube, or the passage of air along the tube to the tympanum. It is a sticky mucous sound, rales, or a blowing sound. (b) *Tympanic Tinnitus* can be demonstrated when the tinnitus is dependent on objective sounds eminating from the tympanum, which can be heard with or without oscultation. They are crackling of the drum membrane on inflation, noises caused by movements of the tensor tympani muscle, rales coming from the tympanum, blowing sounds as the insufflated air enters the tympanum, whistling through a perforation in the drum membrane, succussion sounds sometimes heard when an ear partly filled with a thin fluid is violently shaken, and noises made by foreign bodies loose in the meatus, which are occasionally loud enough to be objective.

(II). *Subjective Tinnitus* is present when the tinnitus cannot be heard by the observer. The diagnosis of its subvarieties is quite difficult, and they usually occur in more or less complex combinations. (A) *Phonetic Tinnitus* is present when the cause of tinnitus is the sound vibrations not sufficiently loud to be objective. The presence of this form of tinnitus is often dependent on impaired sound conduction. The pitch rarely exceeds 256V. This tinnitus is usually intermittent or remittent. (1) *Exaural Tinnitus* is present when the sound vibrations which cause the tinnitus arise outside of the ear. In (a) *Vital Tinnitus* the bodily sounds are subjectively heard. These, in order of importance, are the circulatory, pharyngeal, respiratory, and the muscular sounds. This is a rather rare form of tinnitus, and is dependent on impaired sound conduction. It originates from sounds not loud enough to be objective. (b) *Diplacusic Tinnitus* is excited by external sounds striking the ear. The tinnitus is added to the sound heard without altering its character, or the sound may appear to the patient as

changed. These symptoms are not due to sensory disturbances alone, but chiefly to disturbances of the sound conduction.

(2) *Endotic Tinnitus* is made up of sounds originating within the ear. (a) *Circulatory Tinnitus* is due to sounds which pulsate with the heart beat, and blowing sounds which are lessened or controlled by compressing the jugular vein, or diminishing the blood supply by compression of the carotid or vertebral arteries. (C) *Myotilitic Tinnitus* intermits rapidly like the tick of a watch, or at longer intervals, and is independent of the pulse rate. Occasionally the drum membrane and malleus can be seen moving during the fluctuations of the tinnitus, drawn in by the tensor tympani muscle. This tinnitus is very low-pitched, in the vicinity of 64 vibrations, and of a rumbling nature. The action of the stapedius muscle may make a high pitched, ringing tinnitus—about 1000 vibrations or clicking sound. (c) *Movement Tinnitus* is irregularly intermittent. The sounds instead of being of a ticking or rumbling nature, are creaking or friction sounds and may with an animate body in the meatus, assume to the patient the volume and character of a peal of thunder, or "the tread of an elephant." (d) *Somatic Tinnitus* is present only where there is impaired sound conduction, and is dependent on the somatic sounds of the ear. It is continuous in character—singing, chirping, etc., and moderately low in pitch. When due to the circulatory sounds, the tinnitus pulsates with the heart beat, and may be a ticking or blowing.

(B) *Neurotic Tinnitus* is present when no vibratory cause for the tinnitus can be discovered. (1) *Peripheral Tinnitus* arises from causes external to the auditory apparatus, and may be found in perfectly normal ears. (a) *Reflex Tinnitus* is found in ears with normal or defective hearing, and it is wholly independent of changes in the sound conducting apparatus, but is directly dependent on the irritation of peripheral nerves,

usually the fifth cranial. It commences and stops with the nerve irritation. It is usually caused secondarily by contractions of the intrinsic muscles of the tympanum, or vaso-motor changes in the auditory apparatus.

(2) *Otic Tinnitus* comprises between 80 and 90% of all cases of tinnitus, and is most difficult of diagnosis and the identification of its varieties is sometimes impossible. The source of the tinnitus lies within the ear, and it is sometimes found in combination with phonetic tinnitus. The hearing is usually but not always affected. The nature of the tinnitus is very various, but is never pulsating or the sound of voices. This tinnitus is continuous, rarely intermitting, but the character may change from time to time, and there may be several different sensations in combination. (a) *Conduction Tinnitus* is the largest group of all. It is due to impaired sound conduction alone, the tinnitus arising from the interference with the normal escape of sound waves from the auditory apparatus. It contains most of the cases of grave tinnitus, and is usually low pitched, constant or gradually fluctuating, and as a rule unilateral, or the character of the tinnitus varies in the two ears. The diagnosis is made by eliminating other causes of tinnitus, or by demonstrating the unmistakeable presence of impaired sound conduction. The diagnosis of this kind of tinnitus is made by the ordinary methods used by otologists in arriv-at a diagnosis of the causes of deafness due to affections of the middle ear—inspection, manipulation, hearing tests, etc. Of the varieties of *Conduction Tinnitus* the *Tubal* is the commonest. This may occur in combination with *Reaction Tinnitus*. In the affections of the ear running a chronic course, the onset of the tinnitus is insidious and gradual—occasionally marked by exacerbations. In the affections having an acute course the tinnitus may commence with extreme violence. A tone the same pitch as the tinnitus has been found to aggravate it for a time. (b) *Reaction Tinnitus* when uncomplicated, oc-

curs without impaired sound conduction or loss of hearing, and is due to irritation of the mucous membrane of the middle ear. It is usually associated with *Conduction Tinnitus*. The tinnitus is various in character and not high pitched.

(3) *Sensory Tinnitus* when uncomplicated is wholly independent of the condition in the middle ear tract, or any part of the hearing apparatus except the sensory portion. The hearing may range from normal to absolute deafness, and the subjective sensations may be high pitched sounds, a musical note or voices. (a) *Nerve Tinnitus* is usually high pitched and depends on affections of the acoustic nerve which, when bilateral, are often consequent on a general toxemia. It may be associated with the apoplectic condition, in which case it is usually unilateral. Diagnosis is easily made when there is no evidence of impaired sound conduction, when other kinds of tinnitus can be excluded, and when defective hearing originates in the inner ear or nerve. A tone of the same pitch as the tinnitus has been found to relieve it temporarily. (b) *Psycopathic Tinnitus* may be present in absolute deafness, or with perfect hearing. The subjective sensations are musical tones or voices. It is independent of the sound conducting or receiving apparatus, and is usually associated with other mental defects. This tinnitus most commonly takes the form of the human voice, but it may be musical notes or cries of beasts. Both ears are usually similarly affected, but it is sometimes unilateral and occasionally the sounds in the two ears have constant but different characteristics. The onset is usually sudden, but the tinnitus probably exists some time before the patient differentiates it from his normal sensations.

I hope that this attempt at unravelling a very difficult subject will be seconded by a full discussion.

SUMMARY OF CLASSIFICATION.

Tinnitus:

I. Objective.
  (A) Vibratory.
    1. External:
      (a) Vascular.
      (b) Pharyngeal.
      (c) Respiratory.
      (d) Muscular.
    2. Internal.
      (a) Salpingeal.
      (b) Tympanic.

II. Subjective.
  (A) Phonetic.
    1. Exaural.
      (a) Vital.
      (b) Diplacusic.
    2. Endotic:
      (a) Circulatory.
      (b) Myotilitic.
      (c) Movement.
      (d) Somatic.
  (B) Neurotic,
    1. Peripheral:
      (a) Reflex.
    2. Otic:
      (a) Conduction:
        I. Myringeal.
        II. Tubal.
        III. Ossicular.
        IV. Mucous.
        V. Contraction.
        VI. Adhesion.
        VII. Fenestral.
        VIII. Traumatic.
        IX. Meatal.
      (b) Reaction.

3. Sensory:

(a) Nerve Tinnitus:

I. Peripheral.
II. Trunk.
III. Proximal.
IV. Associated.

(b) Psychopathic:

I. Central.
II. Illusional.
III. Hallucinational.
IV. Delusional.

A CONSIDERATION OF THE VASCULAR THEORY OF TINNITUS AURIUM.

H. O. Reik, M. D., *Baltimore, Md.*

Tinnitus aurium is the descriptive name for the existence of subjective sounds in the ear; sounds which are described by the persons whom they annoy in a great variety of ways. Some persons, for instance, complain of the constancy of the sounds rather than of their character, their nature being rythmical or musical, while others are troubled by noises of a most disturbing kind. The majority of patients possessed of these subjective auditory sensations describe them as being of a singing, ringing, clicking, thumping, hissing, buzzing, whistling or blowing nature and there appears to be a tendency to interpret the sounds as similar to those which are most frequently heard by the particular individual, according to his or her surroundings; that is, it is said that women generally speak of them as musical, ringing or high pitched notes, while men hear the lower tones—boiler-makers, a thumping sound; engineers, a hissing or buzzing noise, etc. Upon one point all are agreed, however, that tinnitus aurium is always an annoyance, generally a very disagreeable companion, and, sometimes, distressing to the highest degree.

That tinnitus is usually only a single feature of an affection, that it is but one of the evidences of a pathological condition, and not a disease *per se* should not detract from its importance to medical men since it constitutes, almost invariably, *the most troublesome* symptom in any condition of which it is a part, not only to the poor victim but to the physician charged with the task of its abolish-

ment. That it has received from the clinical standpoint the full attention that its importance merits is evidenced by the vast array of pharmaceutical preparations which have been employed, with varying but generally disappointing results, as remedial. Yet, in spite of such clinical considerations, we have been entirely without anything approaching a satisfactory physiological or pathological explanation of the production of these subjective sounds, and, there seems to have been little effort made in the past to study the question by physiologic experimentation.

In none of the modern text-books on otology, at least none of those with which I am familiar, is any consideration given to the causes upon which tinnitus aurium depends nor is any attempt made to explain its mode of production, beyond simply setting forth the idea that it results from any agency that produces an increased intralabyrinthine pressure. This idea, that abnormal pressure upon the terminal filaments of the auditory nerve, through the forcing inward of the foot-plate of the stapes upon the endolymph, accounts for the existence of the tinnitus, seems to have become the generally accepted theory, and in recent years its correctness has scarcely been questioned. Many years ago, that theory was challenged by Dr. Samuel Theobald, who, in a very excellent article[1] on the subject not only refuted the arguments given in support of it but presented the more plausible theory that tinnitus aurium might be due to the appreciation of sounds produced by the circulation of the blood in the vessels in or bordering upon the tympanum. In that far Dr. Theobald was, I believe, perfectly right, but in the hypothetical explanation he offered in support of the vascular theory he made one mistake, albeit a perfectly natural one. He assumed that the vascular change occurring was a constriction of the arterioles and that the noises per-

[1]Trs. Med. & Chir. Faculty of Maryland, 1875, Vol. 2, page 189.

ceived by the patient were friction sounds resulting from the passage of the blood current through narrowed channels. Reasoning *a priori*, it was perfectly natural to suppose that irritation of the sensory nerves of the tympanum would cause a pressor, or vasoconstrictor, effect. That such is not the case, however,—the tympanum like the testes being an exception to this rule—I have shown by experimental evidence given heretofore.[1]

That vascular changes might sometimes influence the production of tinnitus was, however, acknowledged long before Theobald's paper was written. Von Trolsch distinguished between two kinds of subjective auditory sensations, those due to irritative conditions of the auditory nerve (Hyperaesthesia acoustica) and those of vascular origin and constant in acute inflammations of the tympanic membrane and cavity. The second class he complicated, though, with the additional explanation of increased pressure of the labyrinth. Various writers have spoken of the possibility of hearing the sounds produced by the blood current, but all have seemed to look upon such instances as very rare and none, so far as I can ascertain, have offered any substantial evidence in support of a vascular hypothesis.

Before presenting my own theory of the etiology of tinnitus, and the evidence upon which it is based, I may be permitted to allude to the several weak points in the high pressure hypothesis. In the first place it is contrary to what is known of the effect of abnormal pressure upon the other cranial nerves. On this point Theobald said:

"Since, however, we have no reason to suppose that the slight increase of tension which could result from the widest incursion of which the stapes is capable—for it is to this that the increase is usually attributed—and which, as a result of aural disease, would necessarily be slowly superinduced, would be competent, *through com-*

[1]Trans. Amer. Otol. Society, 1902.

pression of the nerve elements, to produce so sensible an effect; and since, moreover, we are led by analogy to infer that the sensibility of the nerve would not be so excited, no such effect being produced by compression of the retinal elements in glaucomatous conditions of the eyes; it seems more reasonable to attribute the tinnitus which is known to occur under such circumstances to the accompanying vascular disturbances, rather than to regard it as the expression of an irritation of the nerve, the immediate result of compression."

Secondly, tinnitus occurs as an accompaniment of any form of irritation of the tympanic membrane, as for instance, with foreign bodies or collections of cerumen in the canal, or, with diffuse inflammations of the external auditory canal walls, and where no conceivable pressure is exerted upon the ossicles. I do not mean to assert that unusual pressure upon the foot-plate of the stapes will not produce tinnitus, but that pressure is not essential in the production of tinnitus and that it is unreasonable to suppose that it exists in the majority of instances in which tinnitus is met with.

Thirdly, it is frequently found to persist long after all signs of middle ear inflammation have disappeared and where no indications exist of pressure upon the labyrinthine fluid; with a membrane restored to normal appearance, normal hearing power, and ossicular and membranic movements responding perfectly to the Delstanche masseur.

Fourthly, in many cases the noises complained of can be heard by the examiner if his own ear be brought close to that of the patient or if the otoscope be called into requisition. These are the cases of so-called "*objectively perceptible subjective noises*" and should not be confused with those *entotic* noises that result from abnormal muscular action within the patient's tympanum or Eustachian tube. Certainly the patient's sensations of hearing cannot be appreciated by the observer and the sounds we hear must

be actual sonorous waves originating within the patient's ear. It seems to me this point alone should be quite sufficient to demolish the notion that tinnitus requires increased intralabyrinthine pressure for its production. Even should we admit that constant pressure upon the auditory nerve endings can produce the effect similar to that resulting from the impaction of sonorous waves, the sound produced could by no possibility be recognized by any other individual. That these subjective sounds can often be heard by the examiner is vouched for by excellent authority.[1]

Fifthly, it is a well known fact that distressing noises in the ear may be produced by certain substances when administered in large doses: quinine, the salicylates, etc. Surely no one will insist that this is in consequence of altered intralabyrinthine pressure when we have at hand such a palpable explanation, as will appear later, in the blood-pressure action of these remedies.

Now the first proposition which I have to submit, relating to the etiology and pathogenesis of tinnitus aurium, is, briefly stated, as follows: That *subjective auditory sensations generally result from vasodilator changes in the vascular systems of the middle or internal ear* and may be caused by any form of irritation that will so affect the vaso-motor nerves controlling these vessels.

In substantiation of this hypothesis, I respectfully present for your consideration the following evidence and argument. In the first place you will permit me to recall to you the two papers which I had the privilege of reading before this society at its meetings in 1902 and 1903, and which appear in the Transactions of those years. I there presented experimental laboratory work showing the cardiac and vascular effects of irrritation of the tympanic structures, and of increased intratympanic pressure. You

[1] Gruber's Diseases of the Ear, 2d Amer. Edition, page 133.

will remember that these experiments tended to prove several things:

First, that irritation of the tympanic membrane or the contents of the tympanum (ossicles or mucous membrane covering the walls) causes cardiac and vascular disturbances through alterations in the vaso-motor equilibrium and not by increase of pressure on the ossicular chain.

Second, that under circumstances simulating the pathologic conditions commonly accompanied by tinnitus, positive changes in the calibre of the blood vessels of the tympanum or labyrinth exists.

Third, that these changes, which result from even very slight irritation within the middle ear, are always of a vasodilator character.

If you now recall the fact that the blood vessels of the tympanum and the labyrinth are not only intimately associated but controlled by the same nerves, you are prepared to appreciate the statement that irritation applied to any part of the tympanum may cause vaso-motor changes in both the middle and the internal portions of the ear. The irritant may be a foreign body in the external auditory canal exciting the tympanic membrane by friction contact, an inflammatory swelling of the membrane itself compressing the finer ramifications of the sympathetic in its structure, an exudate within the tympanum, or, a lesion of vessels or nerves in the internal ear; the vaso-motor theory is equally applicable to either condition as an explanation of their mode of action in producing tinnitus. We have then in this theory, what has been so strikingly missing in former hypotheses, an explanation that fits all the conditions under which tinnitus occurs.

My second proposition, relating to the mode of production of tinnitus might now be given very briefly since you have already anticipated it from the evidence and argument that has gone before. It is: that, *stimulation of the vaso-motors of the ear producing a depressor effect the*

small vessels become dilated and the abnormally large amount of blood coursing through them gives rise to new sounds, to which the auditory nerve is unaccustomed. It may be asked—why do we not ordinarily hear the sounds of this circulation? and, it will surely be claimed, that such a small degree of change as can occur in the calibre of these vessels can not produce so marked an effect.

The question is easily answered. The normal relationship between the blood supply and the nerve of audition is so nicely adjusted that no sound of the blood current is appreciated. The conditions for producing some sound are surely there, that is, some sound waves must proceed from a stream flowing intermittently through small calibre tubes, but the nerve has become accustomed to this at a period earlier even than birth and consequently no sound is apparent from the regular normal vascular flow. Let something happen, though, to increase the volume of those streams—and consequently the accompanying noise—or, to raise the sensitiveness of the nerve and immediately an appreciable sound results. Your library clock is ticking along steadily and constantly with a note that you can readily hear at a considerable distance beyond any attainable in that room and yet, under ordinary circumstances you hear it not; it does not annoy you and you are unconscious of its existence. Suddenly something startles you, perhaps a scare by an unusual noise from out of doors, you are on the alert, and at once the ticking of the clock is heard and, more than that, seems many times louder than ever before. The same effect on the hearing would have resulted had some power suddenly increased the intensity of the sounds proceeding from the clock.

Nor is the suggested criticism as terrible an objection as at first appears. On this point I may again quote Dr. Theobald,[1] who says: "Certain subjective sounds, excep-

[1]Tinnitus Aurium, Trs. Med. and Chir. Fac. of Md., 1875, Vol. 2, Page 192.

tional in character, of a pulsating, or of a blowing or hissing nature, comprehended under the name entotic, have long been regarded as vascular sounds, having their origin in the larger vessels which run in the neighborhood of the temporal bone. Clinical observation, however, led me to infer the much more frequent existence of and intimate association between the subjective sounds which accompany aural diseases and the phenomena attending the circulation of the blood. Induced by the result of these observations to examine further into the nature of this connection, I have, after a careful consideration of the various physical, anatomical and pathologicol facts which seemed to have any bearing upon the subject, been led to the conclusion that, in almost all cases, tinnitus aurium, whether associated with aural affections, cerebral diseases or constitutional disorders, is to be attributed to the existence of *vibrations excited in the walls of the blood vessels of the labyrinth by the friction attending the circulation of the blood* which are capable of imparting to the labyrinthine fluid and thence to the terminal filaments of the auditory nerve, impulses similar in character to those which are produced by the vibrations of the stapes, and hence, like them, capable of giving rise to the sensation of sound.

The possibility of sonorous vibrations being thus excited cannot be doubted. Not only is it in accordance with the laws of acoustics, but a number of familiar instances of this phenomenon actually occurring in the human system may be cited. Aneurismal and anaemic murmurs, the *bruit de souffle*, and certain cardiac sounds, are examples. It may be urged that in all these instances the blood vessels are infinitely larger than those of the internal ear, and the mechanical forces concerned proportionately greater; and therefore, that I am not warranted in assuming that since, under such circumstances, vibrations capable of exciting sensible sonorous undulations are produced, therefore vibrations competent to produce a like

effect could be generated in the relatively small vessels of the labyrinth. In reply to this it may be said that, though the amplitude of such vibrations would be infinitely smaller as compared with the amplitude of those of the larger vessels, still, owing to their peculiar relation to the auditory nerve, the impression which they would make upon it might be many times greater.

In illustration of this we may call to mind the effect produced by the accidental entrance of a living insect into the auditory meatus. Though it may have flown in close proximity to the ear without the faint hum caused by the movement of its wings having been perceived; when it has entered the meatus, and in its effort to escape its wings vibrate, perhaps in contact with the membrana tympani, the impression produced upon the nerve is so intense as to be utterly unbearable, and is likened to the roar of artillery or to the loudest peals of thunder. And when, moreover, we consider the conclusions reached by Rieman, as the result of his mathematical investigation of the movements of the stapes, namely that its excursion, in weak though distinctly audible tones, must be so small as to be invisible under the highest powers of the microscope, the wonder seems to be, not that tinnitus should be produced in the way I have indicated as often as it is, but that the friction which must necessarily attend the passage of the blood through the vessels of the internal ear should not invariably excite sufficient motion in their walls to produce a perceptible impression upon this marvelously sensitive apparatus. The prevention of such a misadventure is perhaps one of the most important results accomplished by the elaborate architecture of the labyrinth."

To what extent does clinical experience afford support for these respective theories? I have already pointed out certain clinical evidences that speak against the pressure theory and in favor of the vascular theory. In addition I wish to call attention to several facts which argue very strongly for the latter.

1. Concerning the clinical character of tinnitus, Theobald says:[1] "As a result of a somewhat extended and careful observation of these conditions, I have found that the subjects of them, though they frequently differ widely in their description of the nature of the noises which they hear, almost invariably agree upon certain significant points. They will nearly always tell you that the noises, whatever be their character in other respects, are *at times intermittent* or pulsating; that they are louder and more annoying when they lie down, or after violent exercise; and that it is usually under such circumstances that the change from a continuous to an intermittent character occurs. They will also frequently mention that they become aggravated after indulging in stimulants, or after a hearty meal. It will not be denied that these are indications which point unmistakably to the agency of the circulation of the blood in the production of tinnitus."

Politzer, Lucae, Schwartze and many others have expressed similar views regarding the action of physical exercise, over-stimulation, etc., and Schwartze has added, that, "noises in the ears of healthy persons may follow disturbances in circulation, violent emotions and mental over-exertion. Furthermore, continuous noises may occur during a life time in persons of normal hearing, due probably to anomalies in the course of vessels."

2. Let us consider the conditions, aside from lesions of the tympanum, with which tinnitus is associated. It accompanies syncope, precedes epileptic seizures, and, occurs frequently during convalescence from typhoid fever and similar diseases marked by a long period of depression. In every one of these conditions there exists a relaxed state of the vascular system—a vaso-motor depression.

3. Certain drugs, when administered in large doses,

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[1]Tinnitus Aurium. Trs. M. and C. Fac. of Md., 1875 Vol. 2, pages 195-6.

particularly quinine, ergot and the salicylates, produce tinnitus. To what feature of their physiologic action can this be attributed?

White[1] says of them, "Large doses of quinine produce marked fall of arterial pressure due, not only to its paralyzing effect upon the heart but, to its direct action upon the blood vessels. "Ergot in small doses raises arterial pressure but large single doses produce paralysis of the vaso-motor centres and the blood pressure falls from vascular dilatation." "The salicylates are cardiac depressants and cause a fall in blood pressure. In probably 60% of the persons to whom it is given, tinnitus is produced."

4. Still another striking clinical testimonial is found in the nature of the remedies which we have been using, empirically, to relieve tinnitus. Of all those suggested none, perhaps, have given generally as much satisfaction as ammonium chloride, hydrobromic acid, digitalis, and ergot in small doses. It is sufficient to say of their physiologic action that they all tend to raise blood pressure. Blake has recommended quinine and we find that while large doses lower blood pressure, and produce tinnitus, small doses raise blood pressure, and may favorably affect tinnitus.

5. I have recently been permitted to demonstrate that persons suffering with tinnitus *have a lower blood pressure* than that which is considered normal for healthy individuals. Only recently have we been furnished with a standard for such measurements as these. In the March number of the American Journal of the Medical Sciences, Dr. W. S. Thayer gives us a table showing the average systolic blood-pressure in health, as determined by careful estimations upon 276 perfectly healthy persons. His measurements were made with the Riva-Rocci

[1] White's Materia Medica and Therap., 4th Amer. Ed.: edited by Wilcox.

apparatus and as there is a gradual rise in pressure from infancy to old age the table is arranged according to age, by decades, and shows the number examined in each class:

THAYER'S TABLE, IV.[1]

1-10 yrs.	10-20 yrs.	20-30 yrs.	30-40 yrs.	40-50 yrs.	50-60 yrs.	60-70 yrs.
104.6 mm.	128.7 mm.	136.9 mm.	140.8 mm.	142.2 mm.	154.8 mm.	180. mm.
(37 cases)	(87 cases)	(89 cases)	(37 cases)	(20 cases)	(5 cases)	(1 case)

In the very limited time at my command since Dr. Thayer's article appeared it has not been possible to secure any large number of tinnitus cases for comparison with this standard. Persons examined for this purpose must be carefully selected for, as Thayer points out in the same article, those who have had such diseases as typhoid fever, give abnormally high blood pressure readings, and, as Cooke and Briggs have shown,[2] various other conditions may cause the pressure to appear higher or lower than the normal. Through the great kindness of some of my private patients, as well as of patients selected from my charity clinic, I have had the privilege of carefully examining 10 tinnitus cases; all instances of tympanic affections in otherwise healthy people. The Riva-Rocci instrument was employed and, as nearly as possible, the same plan used that Dr. Thayer described. In every instance the maximum systolic blood pressure was found to be *lower* than the standard average pressure for the given age. In two cases now under observation from day to day (treatment consisting in the administration of blood-pressure-raising drugs) there has been noted a diminution in the subjective aural sounds coincident with the gradual rise in the blood pressure.

I would not want to be understood as drawing any posi-

[1] Amer. Jour. Med. Sciences, Mar. 1904, Vol. CXXVII, No. 3, p. 396.

[2] Johns Hopkins Hospital Reports, 1903, Vol. XI.

tive conclusions from this small number of cases and I feel almost like apologizing for presenting such inconclusive evidence, but small as it is, this evidence is so completely in accord with my conception of the existing condition that I cannot refrain from offering it at this time. Further investigations along the same line will demonstrate in time whether these cases are truly representative of the whole class.

If the above propositions be accepted as properly explaining the cause and mode of production of tinnitus aurium, then, a third one—that *for the successful treatment of tinnitus we should employ blood-pressure-raising drugs*—is necessary to logically complete the sequence.

Feeling little or no doubt of the correctness of my argument, I began in May 1903 to experiment clinically in this direction. Very naturally my first thought was of that substance so much talked of because of its power to raise the blood pressure—supra-renal gland. Local applications of the solutions of Suprarenalin or Adrenalin Chloride to the tympanic membrane or through the Eustachian catheter were not productive of satisfactory results. And that is not surprising since the effect of such applications at long intervals would necessarily be evanescent. We want to secure a steady, prolonged pressor effect. I then turned to the use of the extract of Supra-renal gland and employed that for its general systemic effect by administering one or two grains after each meal. From this, very satisfactory results were obtained. I am perfectly aware of the fact that a fight is on among those who have worked most with the products of this gland as to its powers and, that while some assert that even small doses introduced into the stomach tend to raise the general blood pressure others hold that such a thing is impossible or, at least, that they cannot conceive of its being possible. I am not competent to decide that question but, as a result of my clinical observations, I am inclined at present to array myself on the side of

those who believe it can act in such a manner. Together with my assistants at the Johns Hopkins Hospital and the Baltimore Eye, Ear and Throat Charity Hospital, I have now employed this method of treatment in a large number of cases with results far more satisfactory than any I had attained previously. And here I desire to express my thanks fo Drs. J. N. Reik, E. H. Schild and M. B. Kelly for their careful work with and observations upon a large number of the cases in Dispensary work. I will refrain from reporting the detailed histories here, though I am quite willing to publish such case records if requested to do so. This treatment has been curative or markedly beneficial in about ¾ of all the cases; sometimes the response has been prompt, sometimes slow and only beginning after a period of delay—possibly the effect of internal administration is cumulative. Occasionally it has been necessary to advance to large dosage and, in some instances, ergot or digitalis have served well where Supra-renal[1] had failed. I am not advocating any particular drug, I am merely pointing out the character of remedy to be used. As to the value of local applications I should say that one of my assistants, Dr. Edward H. Schild, has continued the faithful administration of such remedies through the Eustachian tubes and has succeeded in controlling and relieving the noises in cases where I had failed previously by other forms of treatment. I believe, though I have not had an opportunity to try it, that an operation may be required and be perfectly justi-

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*Since writing this, eight months after I began the use of Supra-renal extract in consequence of my experimental work and two months after I had published a preliminary note on its use in the treatment of tinnitus aurium, I have accidentally discovered that it has been recommended for use in that way before. Dr. J. A. Spalding, in a comment appended to a translation of an article on "The Thyroid Treatment of Chronic Deafness," by Dr. Alfred Bruck, of Berlin, in the Archives of Otology, 1899, Vol. XXVIII, page 352, says: "I may add in passing that the Supra-renal Extract, * * * * * * is improving some cases of tinnitus at present under my care." He seems to have used it in a purely empirical way.

fied in some cases—for those distressing cases where the patient, is on the verge of insanity. Several years ago I had such a patient. Nearly every specialist in this city had seen him and tried to assist him but without avail. He died while making an effort to secure relief. Should I ever see such another case I shall certainly try ligation of the external carotid artery.

There will always be cases that will resist this and all other lines of treatment, but that does not necessarily, require repudiation of the suggestions that have been made. I believe it is a well recognized fact in physiological laboratories that a complete repair of an injury to the vaso-motor nerves is not always accompanied by a full return to former conditions on the part of the vessels controlled by those nerves. If a vaso-constrictor nerve be severed there follows immediate dilitation of the vessels under its influence. Re-union of the nerve with restoration of full functionary ability may not be attended by immediate contraction of these vessels again; the return to their former state may not only be long delayed, it may not occur at all.

Permit me then to briefly summarize the following;

CONCLUSIONS.

1. The theory that tinnitus aurium is due to an increased intra-labyrinthine pressure, as applied to the majority of cases, is utterly untenable.

2. The vascular theory heretofore presented was faulty in that it was based upon a misapprehension of the pathological changes that actually take place in the affections with which tinnitus is associated.

3. Laboratory experimentation and clinical evidence unite harmoniously in support of the theory, offered herewith, that tinnitus aurium is effected through vaso-dilator changes in the tympanum or labyrinth and may be pro-

duced by any form of irritation that will so affect the vaso-motor nerves controlling the blood vessels of the ear.

4. That the explanation of the mode of production of the subjective auditory sensations is found in the dilatation of the vessels, permitting an increased volume of blood to pass through them and thus causing the radiation of sound waves which though small in amplitude and intensity are so magnified by the proximity of the vessel walls to the terminal filaments of the auditory nerve that they become appreciable.

5. The proper treatment for the relief of tinnitus should consist in the employment of remedies calculated to raise the arterial tension.

DISCUSSION.

Dr. Blake:—These two papers mark another epoch in the history of this Society, the first of which was made by the communication of Dr. Theobald's.

I want to ask Dr. Reik if he considered in his investigations the question of tinnitus due to obstruction to sound transmission from within outwards on the one hand and increase of circulatory friction sounds on the other? That being the case, Dr. Reik deals in his paper very thoroughly with the mechanical side of the question, leaving the psychological side, upon which Dr. Bryant has touched. Now it is a curious fact that in this first paper there are the answers to questions which were asked by Dr. C——— of Missouri twenty years ago, in his communication on the subject of circulatory tinnitus in the insane, and there are some cases of circulatory insanity that illustrate very well the points brought forward by Dr. Bryant; cases in which with the attacks occurring at intervals of three or four months to a year the preliminary symptom is, in addition to the sensation of fullness in the head, and the cirulatory disturbances, slight tinnitus of a

high pitched tone, which appreciation on the part of the patient with the progress of the circulatory insanity goes on gradually increasing in severity and pitch until finally with the access of the low pitch there comes a suggestion of the voice at a distance; that gradually increasing up to the greatest severity of the circulatory attack.

So that we are really indebted to both of these gentlemen for the work they have done, and Dr. Bryant's classification will surely be valuable to all of us in our differentiation of these cases.

Dr. Randall:—The question of tinnitus has always greatly interested me, as I have always enjoyed it personally and never known what it was to be without it, so far certainly as one ear is concerned, and very frequently as regards both of them. The high-pitched, cicada-like sounds have been present with me ever since I can remember. The recognition of these sounds seems to be, very much as has been stated by Dr. Blake and the others, due to a combination of obstruction to exit and increase of the sound itself within. Yet the matter may be compared to the subjective sensations of vision when we elicit recognition of the vessels of the eye-ground which are habitually unnoticed, by throwing the light from an unusual quarter (Purkinje image). There is a perversion which brings about this recognition, without perhaps any very great involvement of either of those elements which have been stated as being the most important.

The anaemic factor has, of course, been frequently dealt with. I have reported upon the subject myself and pointed out the value of quinia in the relief of these cases where the anaemic factor has been present. I have called attention also to the anatomical consideration of the very marked vortex arrangement of the lateral sinus and jugular bulb in some cases, making it remarkable that we should ever be unconscious of the sound of the blood as it whirls through in the floor of the tympanum and the carotid pulse in the anterior part of the cavity, where we

have not always bony walls separating the carotid from the lining membrane of the cavity. Some years ago I reported to this society a case, probably aneurismal, in which objective sounds could be distinguished even at some little distance from the patient and varied by pressure upon the carotid, or on the catheter in the Eustachian tube.

The suprarenal I have employed internally for the past five years and occasionally with very great satisfaction. The adrenalin chlorid and suprarenal solutions locally applied have failed to produce the benefit I had hoped for, except in that group of rather unusual cases of congestive stenosis of the middle and upper nasal meatus giving rise, probably by changes in intracranial vascular supply, to extra aural tinnitus.

As to Dr. Bryant's remarks about the galvano-electric current in the differentiation, it should, of course, be entirely unnecessary here to call attention to the value of stating whether the benefit is in kathodal or anodal opening or closure. I have, however, known men to use electricity, even the faradic, in the most haphazard fashion; which leads me to suggest that the doctor should be more definite in his finished paper so that there may be no misunderstanding as to how the current is to be used. A great many misunderstand the application, with resulting damage instead of benefit.

One other point, in relation to the respiratory tinnitus, I think we should remember the great influence of the respiratory movements upon the venous current as was not explicitly brought out. It should be considered as being often a matter of venous sound changed by holding the breath.

Dr. Blake:—One point that has been omitted. A very important cause of circulatory tinnitus is where it occurs as a result of hyperesthesia of the neuresthenic and corresponds to the tasch neuresthenic. There are many of these cases in which the tinnitus is a very distressing

factor and interferes with the successful treatment of the case. There should be first an investigation as to whether or not there is any obstruction and if that is negative the attention may be directed to the general treatment. In many of these cases favorable results are obtained under the ordinary rest treatment.

Dr. Leland:—We as otologists are apt to refer all these conditions to the ear, whereas it is probably being recognized now more and more that the ear is only a diverticulum from the nose and naso-pharynx, just as the other accessory sinuses are. It however has a perceptive apparatus and sounds penetrate not only through the external ears and through bone, but also through cartilage. In many of these case of pulsating tinnitus which is synchronous with the pulse the lesion may be found not only in the internal ear or in the congested middle ear, but many of them also depend, as Dr. Bryant has said, on the fact that the naso-pharnyx has an increased vascular supply, especially in the hyperplastic lymph tissue in the fossa of Rosenmüller pressing forward on the cartilage of the Eustachian tube; and the sound of the pulsations is carried up to the ear because of the superior conducting power of cartilage over that of soft tissue. Therefore many of these cases of pulsating tinnitus are due to more or less increased circulation in this hyperplastic tissue in the fossa of Rosenmüller; and in my experience are many cases in which these sounds have been stopped by curetting out this fossa, not only for the ordinary adenoid vegetations, but also for the results of inflammatory processes in them, such as synechiae; and I think I may say that the great majority of cases of pulsating tinnitus that have come under my observation have been cleared up by thoroughly cleaning out this fossa and re-establishing the normal circulation there.

Another cause is hyper-circulation in the tissues of the nose itself. As an aurist I am inclined to look for the origin of the trouble in the internal ear, but often by

reduction of the circulation in the nose itself the tinnitus is very much diminished.

Dr. Bryant also calls attention to the ticking tinnitus which may be objective. It is no doubt, as he says, a constitutional thing. Being of a rheumatic diathesis myself I have suffered from this irregular ticking, which is analogous to the twitching of the orbicularis oris vel palpebrae that we frequently experience. Just as is sometimes felt the choreic twitching of the muscles of the eyelid, I may feel the tensor tympani spasmodically exercising itself when I am a little more than usually rheumatic or lithaemic and with anti-rheumatic remedies or regimen I get rid of it not only in myself but in those who present themselves for treatment, who are generally rather indefinite in their description of it, and also rather apprehensive as to its cause and results.

Dr. Fitzgerald:—I should like to say that in the past two years I have been privileged to treat a number of cases, and I have discarded almost absolutely the usual methods of treatment. I have not yet used suprarenalin, but shall be glad to try it. The most satisfactory results I have ever seen I have brought about in this way: simply giving the patient a normal nose and teaching him how to breathe, how to take every breath as nature intended he should, that is, through his nose. In this way I have eliminated most exaggerated troubles. The most exaggerated case I have had was a lady, who had suffered for twenty years with tinnitus, and she likened it to the noise of a great many alarm clocks set off together, and in addition to that she held the head on one side because she said of a weighty feeling on that side. I taught her how to breathe; previous to that time she had not known. She has lost the tinnitus and the weighty feeling. I believe if we depend less upon mechanical apparatus and new or old therapeutic measures we will get very good results.

Dr. Bryant:—I heartily approve all the gentlemen have

said, having recently read three consecutive papers on tinnitus, but I think the subject is much larger than the discussion would make it appear. I would like to close the discussion by reading my classification of tinnitus.

[See "Summary of Classification," pp. 395, 396.]

Dr. Reik:—I only wish to add a word, inasmuch as I answered Dr. Blake's question at the moment he asked it. In my paper I laid stress upon the noises produced by an increase in circulation, but meant at the same time to accept the other mechanical proposition that the sounds would be increased by reverberation from the ossicles and tympanic membrane whose motion had become impaired through disease.

The clinical pictures that Dr. Leland has presented bear out what I said as to disturbances in the middle ear, nose and throat causing the increase in volume of circulation, and, in connection with his remarks and those of Dr. Fitzgerald along the same line, I would say that I do not mean to favor this form of treatment as specific at all and am quite ready to admit and to urge that pathological abnormalties in the nose and throat, as well as in the external and middle portions of the ear, should be taken care of properly as a preliminary part of the treatment.

ACUTE OSTEOMYELITIS OF THE TEMPORAL BONE.

CHARLES W. RICHARDSON, M. D., *Washington D.C.*

At a former meeting of the Section of Laryngology and Otology of the American Medical Association held in Atlantic City four years ago, I presented a paper entitled "Some Few Cerebral Complications of Mastoiditis," in which I called attention to the existence of osteomyelitis in one of the reported cases. On Nov. 12, 1903, I read a a paper on this subject before the Section of Otology of the New York Academy of Medicine, in which I reported another most typical case of this character. In the interesting discussion which ensued several interesting facts were brought out, but none of more interest to me than that almost all of the gentlemen participating in the discussion had had cases of this character, which, although recognized, they had failed to report as cases of osteomyelitis. It seems, therefore, that it is important for us to call repeated attention to the fact that this serious form of invasion of the temporal bone may take place, to call attention to its serious character and the imperative necessity for immediate and the most radical intervention. To aid in this mission I present this paper today for your discussion.

As you well know, acute osteomyelitis is a suppurative inflammation, or infection, involving the myeloid tissure of the bone. This affection, therefore, can only involve the mastoid bone when it is diploeic, more or less, in structure. This fact, no doubt, in a way explains the relative infrequence of acute osteomyelitis as affecting the temporal bone. The importance of the differentiation,

early diagnosis and immediate operative intervention in this condition can not be more sharply enunciated than by calling your attention to the published report of the discussion of my paper before the Otological Section of the New York Academy of Medicine.[1]

The most characteristic symptoms of acute osteomyelitis, as affecting the temporal bone, is the profound, constitutional intoxication, as evidenced by the marked general depression and the typhoid curve of the temperature. With the onset of the invasion of the middle ear, the temperature reaches within forty-eight hours a maximum between 103° to 104° and maintains this temperature day after day, being uninfluenced by the artificial or spontaneous opening of the membrane tympani. The pulse is rapid and compressible. The general depression is very marked and there is more or less lassitude or stupor. The skin is sallow, the tongue dry and thickly coated, with cracked and dry lips. The local symptoms are characterized by early appearing oedemia, usually within five days after the primary invasion of the middle ear; the extensive area of tenderness; and the extreme sensibility to even the most moderate pressure over antrum mastodeum. In the latter stages of the case, the occurrence of secondary foci of tenderness and infiltration, with abscess formation at points more or less distant from the original seat of infection, with which direct communication through the diploe may be made, should make the diagnosis very clear. Those conditions which impress one the most at the time of the operation are the extensive early appearing oedema, the colloid like character of the soft tissues, as shown when cut through, the early appearing perforation of the cortex and the friable character of the diseased bone.

With this short introduction I shall close my paper with the report of two typical cases, Case I being Case No. II reported in my original paper.

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[1] Archives of Otology, Vol. XXX, y, No. 1, p. 61.

Case I. On Friday, June 19, 1900, I was asked to see a patient in consultation who had developed a mastoid abscess within five days after the initial rupture of the left membrana tympani, which was secondary to an acute influenza. I quite agreed with Dr. Sterling Ruffin as to his diagnosis, after examining the patient. The patient was a young maiden of fourteen years of age, who had previously been under my care for a chronic suppurative otitis of the right ear. On examination of the left ear, I found a well marked and fairly large perforation in the posterior quadrant, with quite a free discharge of thin watery pus. Marked tenderness over mastoid, squamosa, and posterior to mastoid, already showing infiltration of overlying soft tissues. The general condition of the patient impressed me greatly. She appeared very ill. Her temperature had never been below 102° since the invasion of the middle ear, and had attained an elevation between 103 to 104° every evening. Her face was sallow, the tongue coated, and she had the appearance of an individual in the second week of typhoid. The pulse was soft and slightly compressible, about 110. Operation was considered necessary, but attempt at abortion was decided on for twenty-four hours, with the usual local and general treatment. The next morning Dr. Ruffin telephoned me that, as the patient's condition had grown worse instead of better, he would remove her to the Columbian University Hospital, for the purpose of having the operation done. At noon on June 21 the operation was done. On cutting through the infiltrated soft tissue and exposing the bone, the latter was found to have a bluish-gray appearance. On chiselling the bone, it was found to be very friable, and bled freely. There was no pus found in cells or at tip of mastoid. As progress was made towards the antrum mastoideum, a few drops of pus were observed, and, on opening antrum, about five or ten drops more were encountered. The tip was removed, and the bone cut away above and posteriorly until apparently normal osseous tissue had been

reached. The wound was dressed and the patient placed in bed. It will be observed from the chart that the temperature was 102° at 7.30 P. M. on June 20th, the day of admission to the hospital, and remained about the same until immediately after the operation, when it registered 98.4°. At eight o'clock of the same evening it registered 104°. I recognized the fact that I had a high degree of sepsis, but, feeling assured that I had removed the source of infection, I did not feel anxious as to my patient for the first two days after the operation, although the temperature and general condition showed no improvement. Frequent sponge and alcohol baths were employed, they always being attended with a drop in temperature from one-half to one degree. On the third day after the operation, as the temperature was higher, 104.3, and the general evidence of sepsis more marked, I became extremely anxious as to my patient's welfare. The respirations were more rapid, 32; the pulse weaker and intermittent, 114; the tongue was dry, the lips parched and cracked, and there had developed a cough with profuse reddish-brown expectoration. The first dressing was made at 2.30 P. M. of this day. The packing was free from moisture, excepting in that portion of the dressing packed into the antrum. The cavity was cleansed and made ready for dressing. Before reapplying the dressing, I spent about five minutes carefully inspecting the well-cleansed and dried cavity for some possible clew to account for the maintenance of the sepsis. I was just about to replace the packing when I saw one pin-point yellowish glistening point deep in the wound, soon followed by several other similar points here and there desseminated over the osseous wound. These little points of pus grew larger, and, in about ten minutes, dropped down into the bottom of the cup-like mastoid wound. Only the lower portion of the wound was packed; the deep portion of the mastoid terminating in the antrum was covered only by superficial dressing. I saw now that

the osteo-myelitis had extended beyond the confines of the area upon which I had operated, and recognized that quick action was necessary to save my patient. Three hours after dressing, I again operated upon the patient. On removing the dressing, I found that the whole of the cup of the wound had become filled with a thin grayish-yellow pus, amounting to about two teaspoonfuls, which had accumulated since the dressing. The wound was enlarged in the superior and posterior directions. The outer table of the squamosa was followed up to the parietal suture before healthy bone was encountered. Backward along the mastoid the diseased bone was followed into the parietal and occipital bone before healthy bone was here reached, requiring extensive exposure of the lateral sinus. Most of the cells forming the diploe of the bone were filled with pus. The exposed inner tables of bone were freely curretted. Although there were no constitutional evidences of septic phlebitis and the sigmoid sinus appeared perfectly normal in the portion exposed, I decided to open it, in order to eliminate this as a remote possibility of being a factor in the general sepsis. The exposure substantiated the diagnosis. The wound was dressed and the patient returned to her room. The general condition of the patient began to improve at once, and the temperature gradually and progressively assumed a lower place until the fifth day after the latter operation, when the patient had a slight chilly sensation, with slightly greater excursion of the temperature. At the dressing made on the above-mentioned day, June 20th, there was noted a marked redness of the face on the left side, as well as on the forehead. On July 2d, there was another slight chill, more marked than the former one, and, on examination of the patient, I found that there was an extension of the superficial erysipelas over the greater portion of the back, extending from the neck to the lower dorsal region. By July 3d, the erysipelas of the face had disappeared, and, by the 5th, nearly all of

that on the back. On July 6th, the temperature assumed the normal and so continued. The wound remained perfectly healthy from the time of the performance of the second operation until it had completely granulated.

Case II. This case came into my service at the Episcopal Eye, Ear and Throat Hospital. The patient was a young girl of sixteen years of age, who came under Dr. Louis Johnson's observation on March 4, 1904, and by whom the patient was referred to the hospital. On the evening of March 3, the patient was seized with severe pain in right ear. On the morning of the 4th, when first seen by Dr. Johnson, the pain was intense in ear, temperature 103⅘°, pulse 120. On March 5, the ear was discharging, pain somewhat relieved, temperature 102⅖°. March 6: Mastoid painful; intense pain over mastoid that night. March 7: Commencing oedema over mastoid; pain very intense; pulse and temperature remained the same. March 9: Spontaneous pain subsided greatly, temperature 103⅘°, pulse 120. The patient came under my care on March 9 at 2.15 P. M. The patient at this time presented all the characteristic, constitutional manisfestations of the typhoid state. There was marked infiltration over mastoid region, extending back towards occiput and forwards in the parietal. Spontaneous pain not very great; exquisite tenderness over whole mastoid region and more marked over antrum; operation immediately done. On cutting through the infiltrated soft tissues, which were nearly an inch in thickness, the cut surface presented that peculiar colloid like appearance which I have observed always in the condition. The cortex already showed two small perforations; no pus beneath periosteum at seat of perforation of cortext; bone friable; very small amount of pus contained within several pockets in the diploe. Complete evisceration of mastoid and part of occipital bone and squamosa necessary in order to reach healthy bone. On account of the haste made in the preparation

for the operation I found afterwards that the nurses had overlooked the taking of the temperature. The patient was unusually lethargic and drowsy during the day following the operation, the temperature having a maximum wave of 103°. On the third day after the operation the temperature showed a decided fall, reaching the normal on the fifth day. At this time the patient's skin began to clear, the appetite to return, the tongue to clear, the perspiring at night to cease, and the mental state to assume the normal. The case made an uneventful recovery. The severe character of this infection is demonstrated in this case by the continuous high temperature, marked constitutional manifestation and the extensive involvement of bone with perforation of the cortext, all within six days from a condition of perfect health.

A CASE OF EXTENSIVE ACUTE OSTEOMYELITIS OF THE TEMPORAL BONE; OPERATION; RECOVERY.

EDWARD BRADFORD DENCH, M. D., *New York, N. Y.*

The extensive involvement of the bony structures, in this case, together with the rapidity with which the disease developed, seems to me to warrant its report in full.

The patient was a woman, thirty-five years of age, who had been suffering from an attack of grip for about two weeks. Four days before I saw her she complained of pain in the right ear; this pain was extremely severe and soon spread to the entire side of the head. The ear began to discharge about twenty-four hours after the onset of the pain. The appearance of the discharge was not followed by any appreciable relief to the pain. About the second day there was considerable tenderness above and slightly in front of the ear. This steadily increased, and at the time that I saw her,—four days after the onset of the symptoms,—there was distinct redness and tumefaction just in front of the superior extremity of the helix. Pressure over this area elicited excruciating pain, as did pressure over the entire mastoid process. The mastoid was slightly oedematous, but there was no redness excepting above and in front of the ear, in the region mentioned.

On examining the external auditory canal, this was found to be but slightly swollen, the tumefaction being limited to the inner extremity of the canal. The drum membrane was bulging, reddened, and a small perforation was seen in the lower and posterior part. The patient's temperature during the four days previous to the time I saw her, had varied between 101° and 104½°.

The patient was taken to the hospital as soon as possible, and immediately placed upon the operating table. An incision was made from below the tip of the mastoid, following the line of auricular attachment, upward and backward, over the ear, to a point an inch and a half behind the external angular process of the frontal bone. A few drops of pus escaped from the root of the zygoma. An examination revealed a perforation in this region. The covering of the zygomatic cells, and the adjacent squamous portion of the temporal bone was discolored. The mastoid cortex was entered in the ordinary situation by means of a gouge, the entire pneumatic structure of the mastoid broken down and the mastoid process entirely removed. While the mastoid was infiltrated throughout, the most extensive destruction had taken place in the region of the zygomatic cells. These were very extensively developed, and were carious throughout. The internal table had been eroded, and the dura was exposed over an area an inch and a quarter long by three-quarters of an inch broad. The pus was lying in contact with the dura. The zygomatic cells were so extensively developed that they extended into the malar bone. In order to remove all carious bone, it was necessary to do practically a radical operation, although the upper wall of the canal was not completely destroyed. The two larger ossicles were removed from the tympanic cavity on account of the extensive destruction of the tissues within the middle ear and the mastoid. The entire wound was allowed to heal by granulation, and the patient made an exceedingly good recovery. The highest temperature after the operation was 102°, rectal, on the day immediately following the operation.

The case is of interest on account of the extensive bony involvement, and also on account of the rapidity with which the disease developed. An examination of the pus from the ear showed a mixed infection of streptococci and diplococci.

It seems to me quite probable that in this case, the infection in the bone actually preceded the infection in the middle ear or, at least, was simultaneous with it. The patient was in most competent medical hands from the first, and had the case been one of simple acute middle ear inflammation, it would never have been neglected. I think it more than probable, therefore, that the disease started as an acute osteomyelitis in the temporal bone.

While cases of extensive osteomyelitis of the temporal bone have been reported, they are far from common. I recall three other cases of a similar nature, which have come under my observation, and in all of which the symptoms were somewhat misleading. In only one of these cases did I see a perforation through the root of the zygoma; in this case, the history was very much like the one given above, although it is possible that there may have been a previous suppurative process in the ear which had been unrecognized by the patient. The procedure adopted in this case, was the performance of a complete radical operation, with subsequent grafting of the entire cavity; the result was exceedingly satisfactory. In another case of acute osteomyelitis, the symptoms were those of a simple acute mastoiditis. After a thorough operation, the wound failed to heal, and on the introduction of a probe through the exuberant granulation tissue which had developed, exposed bone was detected in the temporal fossa. A second operation was done, and a large portion of the squamous plate of the temporal was found to be carious and was removed. The caries also extended backward at the time of the second operation, into the occipital bone. This case also made a complete recovery, although the operation wound was very extensive, and measured, at least, three inches in its longest diameter.

In a third case, a large portion of the temporal bone and a portion of the occipital, was necrotic. This operation was also extensive, and the patient made a complete recovery.

When we consider that these four cases are recorded out of 439 mastoids, under the immediate observation of the author, it will be seen that an osteomyelitis of the temporal bone is not a condition frequently observed. Only in the case fully reported at the beginning of the paper, do I consider that the osteomyelitis may have been primary.

DISCUSSION.

Dr. Berens:—In this connection I should like to report a case I saw three weeks ago, a woman, sixty-two years old, who gave very much the same history as that of Dr. Dench's second case, and in which there was an extensive disease of the mastoid and of the squamous plate, with proliferation throughout the external table at the anterior part of the root of the zygoma and into the deepest portion of the temporal fossa. She had rather a high temperature, 103-4°. There was also erosion of the internal table with exposure of the dura and a portion of the lateral sinus, with the sinus and dura bathed in free pus. There was a second operation. The patient is now doing well. These cases are too important to allow to go by without at least a mention and therefore I report this particular case in this connection.

Dr. Phillips:—I should like to bring out the fact that it is possible for an ordinary suppurative process in the mastoid cells to go on through the diploic structures of the cranium for a considerable distance, and how would Dr. Dench in his case actually differentiate between an ordinary extension of the suppurative process and osteomyelitis. The line should be a little more definitely defined.

Dr. Dench:—It seems to me that all these conditions are ones of degree. As to a remark in Dr. Richardson's paper that it can only occur where the structures of the

mastoid are diploic, I do not think that this so. The cells in the mastoid represent the diploe of the flat bones of the skull. The wall of the cells in the mastoid are practically diploic tissue.

With reference to Dr. Phillip's remark, Dr. Richardson has sounded the key note; these cases have a high temperature and profound constitutional symptoms. I think that in cases where there is an extensive destruction of the mastoid with extension into either the zygomatic cells, or the squamous plate, that these are all cases of the same disease, varying only in degree, and differing in certain cases according to the development of the temporal bone in the individual so affected.

Dr. Richardson:—In regard to Dr. Dench's remark as to the nature of the temporal bone, the contents of the diploe in one case is entirely different from that of the pneumatic cells. In one there is myeloid tissue, analagous to the marrow. This can be well recognized in making sections of diploic bones in recent cases.

Dr. Dench:—I think if that is looked into more closely that the very walls of the cells have a certain amount of myeloid contents.

RADICAL OPERATION FOR CHRONIC SUPPURATIVE OTITIS MEDIA WITH EXTENSIVE NECROSIS, IN A PATIENT WITH TUBERCULAR HIP JOINT DISEASE AND INHERITED SYPHILIS, FOLLOWED BY TUBERCULAR MENINGITIS. DEATH.

RADICAL OPERATION FOR CHRONIC SUPPURATIVE OTITIS MEDIA WITH ACUTE MASTOID EXACERBATION AND WITH LATENT MENINGEAL SYMPTOMS SECURED LATER FROM MEMBERS OF THE FAMILY. OPERATION IMMEDIATELY FOLLOWED BY LEPTOMENINGITIS. DEATH.

WENDELL C. PHILLIPS, *New York, N. Y.*

Two objects have been in view in presenting the histories of the two cases which I have the pleasure of reporting in this short paper. First, to call attention to the fact that one may happen to operate just at the time when a serious intracranial complication is about to appear and second that at this time when so many men are doing large numbers of Schwartze-Stacke & Stacke operations fatal cases should be reported. While one was operated upon primarily because of acute mastoid symptoms, yet owing to the chronic nature of the disease and the extensive necrosis a Stacke-Schwartze was performed. Briefly related the histories are as follows:

CASE I.

C. K——, age, 15 years, was referred to my clinic at the Manhattan Eye and Ear Hospital by Dr. Daniel Dougherty, July 15, 1902. She had been under Dr. Dougherty's treatment for one year during which time he had resorted to the various methods of local treatment for the relief of a Chronic Suppurative Otitis Media. One year previously he had removed a large mass of adenoids. The mass was sent to the laboratory and tubercular bacilli were found. The patient was undersized and badly nourished. The father died at an early age from dissipation probably complicated with specific disease. Her right ear began to discharge three years ago, while she was under treatment at the Hospital for the Ruptured and Crippled for tubercular hip joint disease, and has continued ever since. There was evidence of pulmonary tuberculosis. Two years later she had an attack of keratitis which was followed by an attack of specific iritis resulting in considerable damage to vision. She had received thorough internal medication for her syphlitic condition. The membrana tympana was almost completely absent and the canal had a mascerated appearance. The ossicles while partially necrosed were still present. She had been gradually failing in health for some time, but had a fairly good appetite and was able to come to the clinic. It was noted that the discharge was unusually profuse. This and the fact that a prolonged local treatment had failed to benefit her led me to decide upon a complete radical operation. She was admitted to the hospital on the morning of July 22nd and after preparation a Stacke operation was performed. After reaching the antrum it was found that the mastoid cells were also involved and a complete Schwartze-Stacke operation was then made and all the diseased cells removed. A specimen of pus was sent to the laboratory which showed the presence of smegna bacilli. No tubercle bacilli could

be found. The necrotic process had extended through both the attic and antrum tegmen so that the dura was exposed for a considerable area. A very thorough curettement was made during which the malleus and incus were removed together with large quantities of granulation tissue after which the wound presented a clean appearance. Hemorrhage was at no time excessive. A Panza flap was made. Up to this time I had had no knowledge of attempts having been made to fill in the exposed areas of bone by the use of skin flaps taken from the surface posterior to the wound. I loosened a tongue of skin and swung it into the antrum region holding it in place by the pressure of gauze packing introduced through the auditory canal. The posterior wound was then closed. A careful examination of the exposed dura was made, but it was found intact. However, it seemed considerably congested. The posterior wound was closed by the use of silk sutures. It had been observed that her temperature upon the day of operation was 100⅘° and pulse 98. This was the first time her temperature had been taken after coming under my observation. At eight o'clock in the evening it had dropped to normal with a pulse of 100. The temperature began to rise during the night and at 8 o'clock on the morning of the 23rd it had reached 100 degrees with a pulse of 102. The dressings had become discolored and the outside ones were removed and replaced. The line of incision of the posterior wound had an unhealthy appearance and a little pus exuded from between the stitches.

On the morning of the 24th the patient complained of considerable pain in the region of the right ear. The dressings were all removed. There was considerable pus coming from the posterior wound between the stitches. These were removed, the wound opened freely, cleaned carefully and packed from behind. The skin flap showed a tendency to slough and was cut away. Her temperature had increased to 101 degrees with a pulse of 120. There

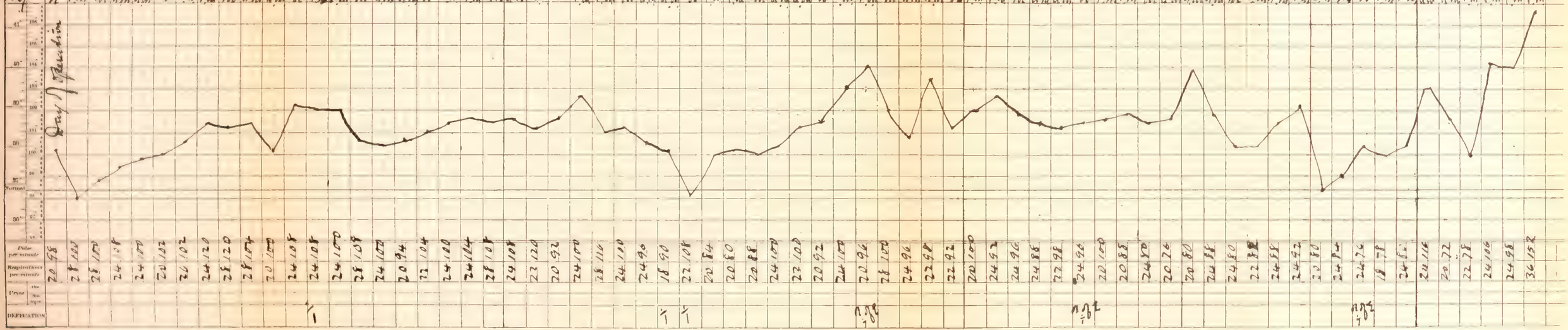
NAME C. K. C. K. C. K. C. K.

DISEASE

1901 July

DATES OF OBSERVATIONS

Day of Fever



was a slight temperature drop at 8 A. M. on the 24th after which it gradually increased reaching $102\frac{2}{5}$ in the afternoon. Under stimulating treatment the pulse became a little stronger and less frequent. At the time of dressing on the 24th, the wound was probed in every direction but there was no communication that could be found leading to the brain. On account of the free amount of pus present in the wound a further operation was advised with the intention of exploring the brain cavity. The mother of the child refused to permit any further operative interference. During the 25th the patient complained of severe headache, but there was no paralysis. It was difficult to get a satisfactory examination of the eyes owing to the results of her keratitis. At this time the odor from the discharge became somewhat marked. During the remainder of the 25th, 26th and 27th the temperature ranged from 102 to normal. The normal temperature, however, only being observed at noon on the day of the 27th at which time the pulse was 90. There was no vomiting, no chills and the patient was conscious and talked freely. Wet dressings were now used and changed four or five times daily and the wound was thoroughly cleaned out each time. The swelling and oedema about the wound had gradually subsided. On the 28th the temperature began to rise and by 8 o'clock in the evening had reached 104 degrees, the pulse however, did not materially increase in rapidity, but was somewhat weak. On the 29th there was a reduction of temperature ranging at about 102 degrees with a pulse of 80 to 100. There was less discharge, but the wound seemed to be sloughing and had an unhealthy appearance. The patient complained of a good deal of pain and there was marked loss of appetite.

Dr. Wm. M. Leszynsky, the consulting neurologist of the hospital was called in and gave it as his opinion that she was suffering from tubercular meningitis.

On the afternoon of the 31st the temperature again

reached 104 degrees which gradually subsided, and on the morning of August 1st it became normal once more with a pulse of 80. She became somewhat stupid, complaining of severe pain in the head and excessive discharge. She gradually became weaker and finally became entirely unconscious and during the afternoon of August 2nd her temperature rapidly arose until the time of her death 9.30 P. M., it had reached 106⅘. All efforts to secure a post mortem in this case were futile.

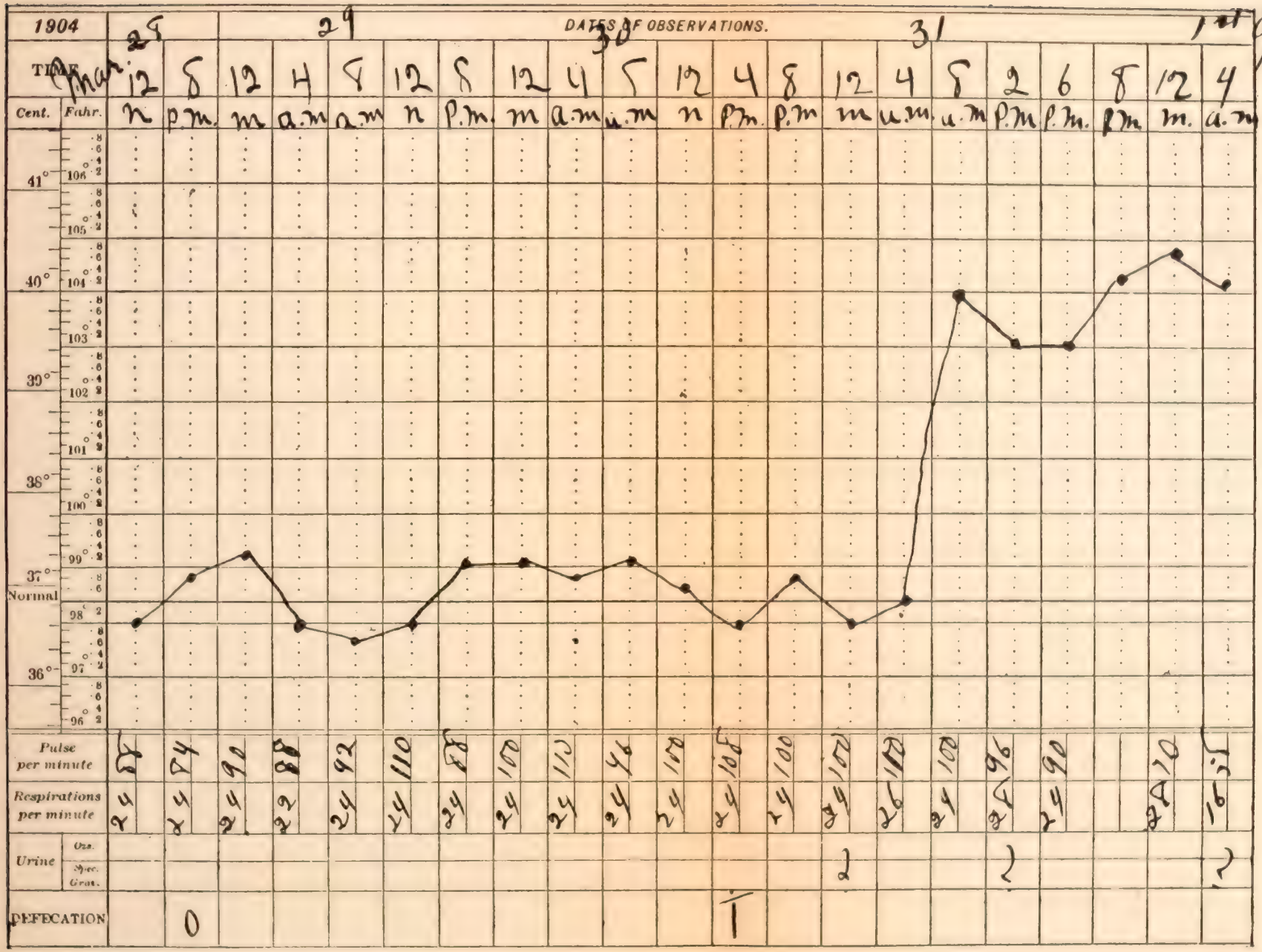
CONCLUSIONS.

1. This was a clinic case and the temperature had not been taken until the morning of the operation when she came into the ward. In the light of the subsequent history she probably had temperature variations for some time. There was, however, no other marked symptoms of intra-cranial disease.

2. Beyond the possible influence of the shock of the operation it would seem that the course of the disease would have been about the same with or without operation.

CASE II.

A. M.——, age 21. Came to my clinic at the Manhattan Eye and Ear Hospital March 23, 1904. Had diphtheria at three years of age which was followed by suppuration of both ears. The suppuration became chronic and had continued for eighteen years. There was odor from the discharge on both sides. The hearing was practically gone in both ears and she complained of some tinnitus. There had been pain in ears at intervals and there was at this time very slight tenderness over both mastoids, more marked on the right side. There was no record of a subsequent call for treatment until March 28th. Upon that date she consulted Dr. Neres, to whom


1904
DATES OF OBSERVATIONS.
25
29
30
31
1st
TIME
12 8 12 4 8 12 8 12 4 8 12 4 8 12 4 8 2 6 8 12 4
Cent. Fahr.
41° 106°
105°
40° 104°
103°
39° 102°
101°
38° 100°
99°
37° Normal 98°
36° 97°
96°
Pulse per minute
98 84 90 88 92 110 88 100 110 96 104 100 102 104 100 96 90 120 96
Respirations per minute
24 24 24 22 24 24 24 24 24 24 24 24 24 26 24 24 24 24 16
Urine
Ozs.
Spec. Grav.
2 2 2
DEFECATION
0 1

she had been assigned for treatment, at his office and complained of severe pain in the right mastoid region. She had been unable to sleep during the previous night and had the appearance of one who was suffering severely. It was noted that she had facial paralysis of the right side which she stated had come on suddenly two days previously. She was admitted to the ward on the afternoon of that date. The ward history states that she had had pain in the right ear on and off since four years of age, the attacks having been of a neuralgic nature. A few days previously she had a severe cold which had resulted in a good deal of increase in the discharge. There was free discharge from the canal and entire absence of both drum and ossicles. There was slight tenderness on deep pressure over the right antrum, the facial paralysis being marked. A smear from the right ear showed mixed infection.

March the 29th at 3.30 P. M. a Stacke-Schwartze operation on the right ear was performed by Dr. F. E. Neres. The attic and antrum were filled with a tumor-like mass which was quite firm. The middle ear also was entirely filled with granulation masses. Neither the dura nor lateral sinus was exposed at any point. All was thoroughly cleaned out and a Korner flap made. The posterior wound was closed with silk sutures. The temperature at the time of operation was 99 and the pulse 110. She had slept fairly well the night before, but complained of pain in the right mastoid region. Previous to operation her ear had been douched freely with bichloride solution $\frac{1}{5000}$ and she had been given two grains of calomel followed by a saline. She slept fairly well during the early part of the following night. Toward morning she vomited freely a greenish liquid and complained of severe pain in the lumbar region. Her temperature however, did not go above 99 degrees, pulse 110, respirations 24. The pulse was weak. The facial paralysis remained the same as before operation.

At 4 A. M. on the 31st the temperature began to rise and by eight o'clock it had reached 104 degrees. The pulse was intermittent 110.

On the 30th a specimen of urine sent to the laboratory showed a specific gravity of 1030 with no albumen, but slight trace of sugar.

On the 31st catheterized at 8.15. A specimen sent to the laboratory showed a specific gravity of 1024 with a large amount of albumen and some sugar. The microscope revealed granular, hyaline and epithelial casts. The dressings were removed at 10 A. M. and the ear repacked with iodoform gauze and there was no sign of pus or extension of infection. The temperature arose gradually until it reached 105 degrees and the pulse became weaker. The patient became unconscious. Further operation was refused by the family. She was given strychnia and morphine at intervals and once or twice doses of nitro glycerine. She died at 1.30 P. M. April 1st. A post mortem could not be obtained.

During a conversation with the mother during the last day of the patient's life it was learned that about two weeks previous to the date when she came to the hospital she had had a severe attack of vomiting of a projectile character with violent headache and partial loss of consciousness which had lasted for two or three hours. The family physician had told them that it was a bilious attack, so that they had not in any way connected the occurrence with her middle ear disease. The complete Stacke-Schwartze operation was performed on account of the very chronic nature of the disease.

CONCLUSIONS.

1. The acute exacerbation of mastoiditis in this case was sufficient cause for operation.

2. The chronic character of the suppuration justified the radical operation.

3. The paralysis, while considered due to either local pressure or extension of necrosis should have led to more serious consideration of possible meningeal symptoms, which were not discovered until after operation.

4. It is not probable that beyond the effects of shock the operation had any influence upon the course of the meningitis. It is to be regretted that no post mortem could be obtained.

DISCUSSION.

Dr. Dench:—I think that Dr. Phillips deserves a great deal of credit for reporting two cases of this kind, for while we are all very glad to report successful results we naturally hesitate to report those in which the outcome has not been what we desired.

I have tabulated a series of ninety-eight cases of radical operation and am sorry to report two fatal cases, but in neither of these do I think that death was due to the operation. In one there was a history like that in Dr. Phillip's case. The child came in with an acute exacerbation of a chronic trouble, with a temperature of 101-2. I did the radical operation and exposed the dura, applying a skin graft and packing in the ordinary way. The child was returned to the ward. For two or three days there was considerable vomiting. The temperature at first dropped to normal, then began to rise, and the child died of what seemed to be meningitis. There was no autopsy in this case, as it was not obtainable, but I had the child seen by prominent pediatrists, who agreed that it was meningitis. Lumbar puncture was made and the fluid removed from the spinal canal was found to be sterile. I felt at first somewhat guilty for having applied the skin graft, but you can not apply anything much cleaner than a Thiersch graft.

The second fatal case was a patient where neither the dura in the middle cranial fossa nor the sinus was ex-

posed. This patient died of broncho-pneumonia. These fatal cases should be reported because it is necessary to establish at the present time the rate of mortality of this operation. We must know whether we can advise patients suffering from suppurative otitis to submit to the operation. I think the doctor has inaugurated a good proceeding in reporting fatal cases following this operation.

Dr. Holmes: — I wish to call attention to a case I had in a young postal clerk thirty years of age, who had incipient phthisis and had for many years suffered from double purulent otitis media. There were no active mastoid symptoms, except that his condition had become worse and the odor very offensive as time went on. I advised him to undergo the radical operation. He came into my hospital and I operated on the right side first. There were no untoward symptoms, in fact the recovery was apparently good. The wound was healing nicely and to all appearances, notwithstanding his tubercular condition, recovery would take place. Encouraged by this I advised operation on the other side as that was also in a very much diseased condition. The patient did not rally so well after the second operation. There was an extensive necrosis of bone; the dura and lateral sinus were freely exposed, but nothing found to indicate intracranial trouble. The rise of temperature in the evening which he had been subject to some time before the operation, continued; and as it was in the warm part of the early summer and his home in the country I had his family physician come to see me and we decided that it would be well for him to go out into the country. About two weeks after that I received a note from the doctor that the patient was rapidly failing, that his temperature had increased, and about a week after he reported to me that the patient had died. The physician did not secure a post mortem, but from the symptoms there could be no question that he died from meningitis and we have

reason to believe that it was tubercular. That is the only case of the kind I have encountered.

That inherited syphilis also plays a most important part I am well aware because I have been struggling with a case for two years. A well-developed young child while on a visit in another city was taken with fever. Two of the leading physicians and an otologist were called in, his temperature ranging from 101 to 103½ daily. No positive diagnosis was made even after the most careful examinations. There was no visible involvement of the ears and after three weeks the parents took the child back to Cincinnati unimproved, where the family physician saw the case. About a week later a swelling developed over the mastoid, and the case was referred to me. I performed the classical operation and the child apparently made a splendid recovery, but during the summer the mastoid broke down again. I curetted the parts, but found bone healthy, and again it healed, only to break down again in a few months. I then made the radical mastoid operation in a most thorough manner, and the parts healed as usual only to break down again. As a last resort, I made a very large skin flap from the scalp lining the cavity throughout with same. It took perfectly at first, then began to show signs of breaking down. It was then as a last resort I began vigorous antispecific treatment with the most surprisingly good results and the severe nasal catarrh from which he had also been suffering improved in an equally rapid manner.

The criticism I make upon myself is, that I should have resorted earlier to the antispecific treatment when there was no visible surgical reasons why the case failed to heal.

Dr. Fryer: — As to the point that the operation had no effect one way or the other I should like to say that often we are asked by our patients if we can promise a favorable result. Of course we cannot. Where there is general sepsis our prognosis is of course unfavorable. It

is important in these cases if there is sepsis, that we should promise little or nothing, saying simply that we will do the best we can, but that without operative interference death is certain.

Dr. Randall: — There are one or two points, possibly not apropos, that I would bring out. At a previous meeting I showed this specimen from a child having tubercular hip-joint trouble, which has a possible bearing upon this case of Dr. Phillips', as showing one or two things. It may seem a serious comment upon the lack of thoroughness of my operation in this individual case: it should be borne in mind, however, that it was a good many years ago when we were not so radical. It shows also the possibilities of healing. The specimen examined now shows evidence enough of the carious cause of the cavernous sinus thrombosis. Any one looking at that bone would hardly believe that it had been at all fully dealt with one year before. That I should have had my finger inside that mastoid would seem incredible when you see how the bone-healing took place in spite of the condition of the patient. The child had a year before passed out of my hands and was in a convalescent home for the coxalgia. There was a return of the hip-joint trouble and it was full of pus at the time of death.

Another specimen I brought incidentally shows a sequestrum formation in a tubercular case. The lung symptoms were so serious that we could not give an anesthetic and the patient was not able to submit to an operation.

I should like to call attention to the point that sometimes a study of the eye-ground may give us help in the recognition of the incipiency of serious tubercular trouble, in which the symptoms have not been presented to us by the persons giving the history and we may thus find something that we would otherwise fail to get until too late. If we do not make this study of the eye-ground we

have a sense of having failed in something of our duty—usually negative as the findings are.

In the matter of these fatalities, I am afraid I cannot claim so good a record as Dr. Dench. I am averaging quite 5% of mortality in my mastoid operations.

Dr. Dench:—Mine were only in chronic purulent trouble.

Dr. Randall:—In them I think the operation probably about doubles the small risk of the anesthetic, and I am in the habit of so stating the prognosis.

In dealing with the septic involvements I have thought I got a very distinct advantage from the use of saline injections and of the high enema. There is no objection offered to the latter although frequently hypodermoclysis would be refused. We get a good washing out of the intestinal tract and if the fluid is properly retained we frequently see in cases of mild sepsis a very marked result following, with rapid lowering of temperature as from cold bathing. In a case where there is a suspicion of meningeal involvement I am quick to use the lumbar puncture, and if there is any apparent result, or if the symptoms are continued, I repeat it as a therapeutic as well as a diagnostic measure, repeating it at need several times a day until I can no longer obtain any notable amount of fluid from the canal. It is, I think, the means of life-saving in certain of these cases; and where we have in the findings of such puncture a probability of tuberculosis of the meninges we can, I believe, wash out the arachnoid cavity as the general surgeon washes out the peritoneal cavity, with the probability of saving a good many cases.

Dr. Blake:—As to Dr. Dench's remarks about the skin graft on the dura I should like to ask how far the gentlemen have used the grafts where the dura is extensively uncovered and where there is a tendency to hernia?

Dr. Reik:—The question has been referred to by several of the speakers as to the mortality of the radical

operation. I think we should carefully classify the cases we refer to when speaking of this subject. We all agree, of course, that the risks of an operation where there are complications in the way of mastoiditis, or involvement of the sinus, or cerebral symptoms, are greater than in those cases where we operate simply for the cure of the chronic suppurative process. I have been accustomed to consider the risk of the radical operation in the chronic suppurative cases as almost alone those of the anesthetic. Recently, however, my attention was called to some statistics in a paper by Dr. Gradle, in which he makes the bald statement that the mortality of the radical operation is practically 8%, and says that in 126 such operations in a certain hospital there have been 11 deaths. He doesn't state upon what class of cases the operations were performed nor whether complications existed, but I have heard these statistics quoted by physicians and surgeons as indicating that the radical operation for chronic otorrhoea is of itself a dangerous one. It has seemed to me that the radical operation should, per se, have no mortality. I understand that Dr. Harris has looked up the statistics of this operation and would like to ask him to speak of them.

DR. HARRIS:—The subject which Dr. Phillips has brought out in his paper has been one of great interest to me. I some time ago presented a short paper on the subject in general. My feeling has always been one first of the great value of the operation in the well recognized and well chosen cases. It would seem in the two cases upon which he operated that there is clearly a possibility of lack of careful discrimination of the cases before operation; that the matter of the temperature charts, etc., had not been well enough looked into. As the last speaker, Dr. Reik, has said, we should speak of the different classes in discussing the mortality. It would hardly be fair to include these two cases. In one of the cases there could not have been any result such as followed, from the

technique; it was due to something that was there before operation. I have always felt that the operation deserved a greater discrimination in chosing cases; that we were not working in a field free from danger. I think the doctor deserves great credit for reporting these cases. I recently looked up the French and German literature and found a large amount bearing upon the radical operation. I should say that from twenty-five to fifty papers have been written on the subject by French and German writers in the last two years. In the literature I did not run across a single case of fatality in the radical operation. A number of cases were reported where it had been done for intracranial complications followed by mortality, but not where done for suppurative trouble.

I am aware, in addition to the two cases of Dr. Phillips' and one of Dr. Dench's, of one that was reported by Dr. Toeplitz of New York, which terminated fatally, two weeks after operation where he did not regard that there had been any preceding complication whatever. He looked upon it as a clear case of sepsis. At least one case has occurred at N. Y. Eye and Ear Infirmary. I was also able to get from the House Surgeon of the Manhattan Eye and Ear Hospital an informal statement. He said that in sixty-three cases he had seen in his own service that there had been six deaths from meningeal complications.

It is my own personal feeling that in spite of the fact that there should be no mortality, that because of the region we are working in and because of lack of proper technique, the mortality is larger than that reported in the literature.

Dr. Pooley:—So much stress has been laid upon the danger of the operation that I would speak of the good effect that sometimes results where there is already danger of cerebral disease. This was brought to my mind by a recent case in which the patient had a long continued suppurative disease of the middle ear and rejected opera-

tion until the advent of symptoms of a distinctly cranial character. Not until the supervention of attacks of unconsciousness and dizziness was operation consented to. The radical operation being performed, as a first result the patient was at once relieved of the intracranial symptoms. We may as well emphasize the good results while speaking of the dangers.

Dr. Jack: — To revert to the dangers of the operation I remember a case occurring in my service, operated upon by a competent assistant, a laboring man in perfect health, a fine physical specimen. The radical operation was performed at the Massachusetts Eye and Ear Infirmary for a chronic otorrhoea which he had had for a number of years. In twenty-four hours after the operation his temperature commenced to rise and he died in a short time of meningitis, the autopsy confirming the diagnosis. Most of the fatal cases mentioned by the reader had some constitutional disease such as syphilis or tuberculosis or a condition leading one to fear complications.

The subject of the radical operation is very important and one that we should consider carefully for sometime. At present I do not think we can advise a patient in perfect health, with the exception of a chronic middle ear discharge, this operation as a cure for his otorrhoea without carefully considering the risks of permanent injury to the facial nerve or of life itself.

Dr. Blake: — I had a case of a man who came to me from the Philippines whom I had seen fifteen years before with chronic suppurative trouble that had been treated from time to time by cleansing. At the end of his term of service he came to me with the intention of having an operation performed for the relief of the trouble. I did it; went through a sclerosed bone, and struck an extra-dural abscess. He came in perfectly well, so far as a man with a septic process could be, had been able to go on with his work, etc. He did very well for seven days, but on the

seventh day a meningitis was lighted up and he died in twenty-four hours.

Dr. Jack: — Dr. Blake emphasizes the point I have just made i. e. that something was found in these cases post mortem to account for a fatal result; in one case an extra dural abscess. In one of Dr. Phillips' cases there was tubercular trouble, and in the other cases mentioned there was something beside the operation to account for the fatal results. In my case however, there were no known causes. The bone over the tegmen tympani and mastoid was apparently perfectly healthy. There were no polypi, no granulations, only caries of the ossicles. The dura was exposed for a quarter of an inch, and was perfectly healthy. Possibly a middle ear operation in this case would have been sufficient.

I believe in the radical operation as a last resort for the more serious condition after all other means have failed.

Dr. Dench: — It seems to me that the cases referred to by Dr. Blake and Dr. Jack make it more important to do this operation. One case, a man in absolutely perfect health was seen by a prominent otologist in New York before any one knew about the radical operation. The man was a candidate for life insurance and they would not accept him because of the discharge from the ear. I told him that I believed the discharge could be cured by operation. While the disease had practically run its course there was a little discharge and it would have to be cleared up before he could be declared safe. An opening was found in the tegmen tympani at the operation, and there was a small opening through the dura. That man made a good recovery and has an absolutely good ear. We do not know what we are going to find until we expose the tegmen tympani. The whole thing is be careful what you say to your patient until the field of operation has been exposed, for you cannot know until then what you will find. In another case I also found

whether it might not be acute brights, and the same thing suggests itself in the case reported by Dr. Jack.

All of us who do radical operations are aware of the fact that there are a great many cases of intracranial complications where there is an intact tegmen.

FIBROMA OF MASTOID, AURICLE AND AUDITORY CANAL.

THOMAS R. POOLEY, M. D., *New York, N. Y.*

The patient, a Polish Jew, twenty-nine years of age, was admitted to the New Amsterdam Eye and Ear Hospital, July 28th, 1903. He states that thirteen years ago I removed a growth from behind his ear and auditory canal, and that there was no return of it until two months ago.

On his admission to the hospital, there was a large elastic growth, situated behind the ear, close to the attachment of, and extending for some distance on the posterior surface of the auricle, about the size of a pigeon's egg; also another filling the meatus, and extending for some distance into the auditory canal, about the size of an olive. In the operative procedure the growth from the canal was first removed by dissecting it out with scissors as far back as possible; this was followed by considerable hemorrhage, which was controlled by plugging the canal. An incision was then made, following the line of attachment of the auricle, from above downward. The integument was dissected back, exposing the tumor, which was firmly adherent to the cartilaginous concha. This was carefully dissected away, but being firmly adherent to the posterior wall of the auditory canal, an opening was made into it, connecting the two wounds. The operation throughout was difficult, because of hemorrhage, and the intimate relation of the posterior attachments of the growth to the concha and upper part of auricle. After the operation had been performed, the wound was united with fine black silk sutures, the canal packed with iodoform gauze, and a roller bandage tightly applied.

On July 30th, at the first dressing, the wound seemed to have united. On July 31st, a renewed growth was removed from the canal. August 2nd, posterior wound breaking down, and an abscess collecting below the lobule. August 4th, an incision at the angle of the jaw was made and considerable pus removed. A connection was made through this incision with the auditory canal and a gauze tent inserted. August 7th, condition remains about the same, posterior wound suppurating and auditory canal again refilled with tumor and granulations. At this time I left the city and the case was treated by Dr. Cook, the house surgeon. On August 10th, another incision and curettment was made, increasing the length of the incision at the angle of the jaw. No pus was found, but a phlegmonous condition of the parts could be seen and was removed. Not much improvement followed. August 14th, has severe headache, dizziness and nausea, indicating labyrinthine involvement.

At this period of the case, Dr. Cook began treatment by the X-ray, which was followed by an immediate improvement in the patient's general condition, the pain, dizziness and headache gradually disappearing, and by September 9th, the wound back of the ear had entirely healed, suppuration ceased, and there was but little of the growth to be seen in the meatus. At this time I returned to the city, and was surprised at the improvement made by the patient, and had the X-ray treatment continued for a time. The patient, however, soon became so well that he discontinued further attendance, and was lost sight of. I have not seen him since, but as he was persistent in his pursuance of the treatment while suffering any discomfort. I infer he is virtually cured.

An examination of the tumor, made by Dr. Edward B. Coburn, Pathologist to the New Amsterdam Eye and Ear Hospital, shows that the specimens consist almost entirely of dense connective tissue. Certain portions are abundantly supplied with large blood vessels. *Pathological*

diagnosis: Fibroma. The clinical diagnosis was sarcoma, which is not sustained by this report, notwithstanding which the course of the disease, with its frequent relapses, and the length of time required to secure a healing, show at least, to my mind, the malignant character of the disease.

Paget, *Surgical Pathology*, 1860, long since proposed the name, "Recurring Fibroid Tumor" for a group, "the chief characteristics of which are that their general aspect very closely resembles that of the common fibrous tumors; their microscopic structure consists of corpuscles, caudate and elongated, as if developing into fibres; and the most striking feature in their history is their proneness to return after removal."

At all events, there is in this case no well-defined border line of distinction between malignant and benign, except in the microscopical examination.

Until I had the experience afforded by this case, I was decidedly agnostic as to the good effects of the X-ray in malignant growths. There can, however, be no doubt whatever, that the relief afforded to the patient by its use in this case, was immediate, and that the reparative process, so long retarded, was also promptly begun when the X-ray treatment was instituted.

NOTES ON NEOPLASMS OF THE EAR.

B. Alex. Randall, M. A., M. D., *Philadelphia, Pa.*

The occurrence of malignant growths of the ear has been sufficiently infrequent to make the subject seem worthy of some notes; and a glance at the authorities has shown that only some sixty cases of carcinoma and some forty of sarcoma have been put upon record. Of these a notable proportion have been by American observers; and it is worth inquiring whether these conditions are more frequent on this side of the Atlantic, just as the osteoma of the auditory canal is certainly more common in Great Britain. Excepting the epithelioma of the auricle, which of course is relatively common, and a few cases of sarcoma certainly or probably originating in the parotid and extending to the ear, I have met but one case of sarcoma and one of carcinoma, strictly aural in origin, and desire to place the notes of these on record.

A woman of 53 years, of English birth, was seen at the Episcopal Hospital in June 1887 suffering with a fungating growth in the right auditory meatus, which had been removed a year or more before as "a polyp." The growth had now returned and gave much pain in the ear as well as in the head. There was swelling of the pre-auricular region and some glandular involvement. The walls of the meatus were affected almost to the exterior. The growth was white and insensitive and the deeper parts tough and gristly to the feeling: it appeared under the microscope to be a large round-celled sarcoma. The growth was divulsed and curetted as deeply as possible at several sittings; but as she would often be unable to return for ten days it would be as large as at the previous visit. She

was advised to come oftener or else she must be taken into the hospital and have a more radical and complete operation. After two months she was operated on under ether, the canal being curetted, and the bony meatus found bare and rough, as was also the promontory. Under the advice of my colleague I did not scrape very much and cauterization was very light, as the patient was in a very wretched condition. No excessive reaction followed and improvement was slow but steady. Curetting was repeated a fortnight later and was well borne without ether, but cauterization gave great pain: a strip of the upper anterior wall 3mm wide now seemed entirely free from recurrence.

In September a second operation more thorough than the first was performed. This time the bare bone was well scraped and the affected region well cauterized with Chromic acid. Recovery was very slow as before. Two weeks later there was a recurrence of the trouble but it seemed confined to the outer part of the lower posterior wall, all the rest of the canal being clear. The outgrowth resembled a cauliflower in its white, dead fungosity but bled freely on light touch.

A third operation was done at her home on October 14th the growth having again closed the meatus. Curetting was very thoroughly done, probably passing through the posterior wall of the cartilagenous meatus, and was followed by deep cauterization with Chromic acid. There was no effect for good in her condition but a rapid advance of the swelling over the mastoid. The elasticity of this swelling made pus seem possible but poulticing only increased its redness and after lessening the pain seemed to increase it.

On November 8th the meatus was again freed of a cauliflower mass, paliation alone being now in view. One more operation was proposed, but with the statement that the mastoid and perhaps parotid region would have to be attacked and it could only be done in the hospital, and it was declined.

On November 11th, the posterior swelling was more red, prominent and painful, fluctuating distinctly. It was incised, evacuating several ounces of pus, thoroughly syringed, then a tent was inserted and poultice ordered. Later there was swelling in the tonsillar region with spontaneous evacuation of a large amount of pus into the pharynx, and another abscess with fungating walls formed in front of the ear. [Fig. 1.] Exhaustion with delirium and coma progressed and she died December 12th, 1887. No autopsy was permitted.

FIG. 1. Sarcoma of External Auditory Meatus, with suppurating extensions before and behind Auricle.

A woman of 50 was referred to me in March 1903 as troubled for a month or two with irritation of the right external auditory canal. She had dug at the irritated surface with a tooth-pick and a growth had appeared, which on removal seemed fibroid under the microscope.

Fuming nitric cauterizations had failed to check the growth and I found the inner third of the canal nearly closed by an annular thickening of fine papillary surface, very sensitive and bleeding easily. Even under cocaine injections removal was not possible and operation under ether was advised. The opinion was given that the papillomatous growth might prove epitheliomatous. On March 30th, under ether, the canal was denuded in its inner half down to the normal looking drum-head and the bony wall superficially curetted. Recurrence seemed prompt and nine days later I operated again exenterating the tympanic cavities and adjacent canal and mopping the surfaces with pure carbolic acid. There was much pain but no febrile reaction and after three days facial palsy supervened and grew slowly complete. The sutured posterior wound reddened and grew puffy after primary union—one stitch-hole after another suppurated and all the cellular tissue along the wound was exfoliated as white pulpy masses through a dozen openings. An infective blush was present along the wound, with vague and slight induration but the temperature did not exceed 99°. Daily dressings with all antiseptic precautions were continued with very slow healing. On May 11th, there was some fever; but little seemed amiss when I paid a second visit before leaving for the congress in Washington. Next day full-blown erysipelas appeared, spread over the face and involved the other ear, but with only one day of fever. The convalescence was slow but good, and the facial nerve returned to full function. Examination of the tissue removed showed in part inflamed skin, but a distinct papilloma was present at the lower anterior portion of the canal and its deepest parts showed pearl-bodies of squamous epithelioma. [Fig. 2.] Some discharge continued for months and the bone of the lower anterior wall became denuded, but I noted no clear recurrence on September 23. There was distinct whitish papilloma down and forward on November 3, but removal was declined and X-ray

treatment undertaken. Later details have not been obtained.

Ten days after the second operation in this case I operated with a colleague in another city. My instruments and their case had been sterilized, apparently adequately; so some were used without renewed sterilization when unexpected need for them arose in the exenteration. A week later this patient developed erysipelas: but I truth-

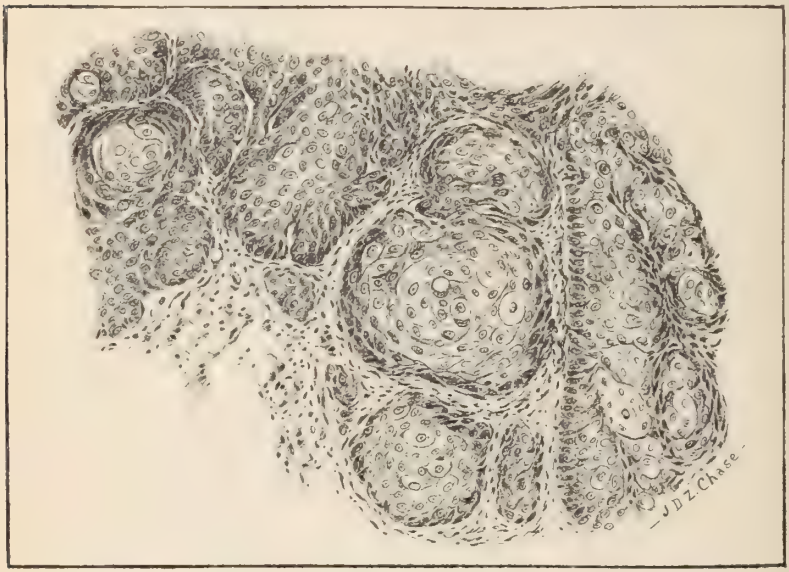


FIG. 2. Papillomatous growth from depth of External Auditory Canal, showing pearly cell-nests of Epithelioma.

fully said that to the best of my knowledge I had not seen a case for a year, since it was not till a month after that my patient had her clear-cut attack. I then learned that her physician, who had been present at her first operation but detained away from the second by what appeared acute Highmore inflammation, had gone on to full-blown erysipelas. Whether he gave or took it is in doubt; but

I fear my instruments were responsible for the other case, having become infected from the latent erysipelas of my patient. It is regretable that her attack had little or no influence in preventing recurrence of her growth.

The occurrence of exostosis of the auditory canal is rare enough in our experience to secure little notice from most American Otologists, and this might make us wonder at the space assigned to it in the writings of our London colleagues. Study shows, however, that it is a subject well worth consideration on this side of the Atlantic; and we may learn from this infrequency as well as from the measures employed in combating the lesion. One point bearing out the experience of the London men that osseous overgrowth in the canal, whether in the form of well marked exostosis or of mere hyperostosis, is commoner with them, lies in the experience here that British-born patients are much the most prone to its occurrence. And the corollary is well to bear in mind, that where it is found in other than Britons there is strong probability that it is not primary, but due to middle-ear suppuration, which may be difficult of demonstration, yet hugely increases the seriousness of the affection. The inconvenience of a bony growth nearly closing the auditory canal, impeding the exit of the epidermal and ceruminous debris and often clogging the penetration of sound-waves, is sufficiently obvious; and those who have worked to cleanse the canal of such obstructions realize how easy it is to remain in ignorance of what lies beyond. Irritation of the skin covering the growth and that of the adjacent wall will often complete the closure and temporarily cause deafness and pain; but this is only a valuable warning as to the more persistent and dangerous obstruction which can easily occur. It is needful to recognize the occurrence of unimportant forms of the affection such as the little pearly nodules not infrequently seen close to the drum-head: these are probably either congenital enlargements of the

tips of the annulus or fibroid only, as they are almost unknown in the macerated bone and have little tendency to annoying growth. So, too, the multiple hyperostoses of the walls of the canal which occur particularly in gouty subjects, are apt to be self-limiting by mutual pressure; and while they greatly narrow the canal, rather rarely tend to close it. To these forms, in the absence of suppurative disease, we need probably give only minute study and record, so that we can detect any notable increase such as occasionally occurs.

The individual bony growth has little of this self-limiting quality and is inclined under constitutional or racial stimulus to become a serious obstacle to hearing; and when combined with the possibilities of damming in a suppurative condition it may be a serious menace to life. Whether bathing, with the penetration of water into the ears, is a factor in its occurrence in the upper-class Englishmen, as it seems to be with the semi-amphibious Sandwich Islanders, is open to doubt; and no predilection for excess of bathing has been ascribed to the ancient Peruvians or our own Mound-builders whose skulls show most frequent occurrence of the anomoly. Gout and other constitutional causes are unproven factors in its production and medicinal treatment seems unavailing; and the practical fact remains that we have no other than operative means for combating the affection, when it grows threatening.

Like the exostosis elsewhere, these growths are generally of ivory-like consistency and have given great trouble to operators who have undertaken to chisel, drill, or file them away, being ready to ruin most of the tools employed against them. The knowledge that the bone from which they arise is generally cancellous and sometimes softer than normal, has not been fully appreciated; and difficulty has not always been avoided by attacking this rather than the stony growth itself. Without dealing with the many operations by drill, trephine, file, forceps,

and chisel, suffice it here to note that in the half dozen cases upon which I have operated, it has proven invariably easy with a large gouge to shell out the growth with a scale of the bone at its base, and remove it without injury to the tool or the surrounding tissues. Where it arises from any except the posterior, mastoid wall of the canal there is little room for penetration of the chisel without laying bare the adjacent structures, the dura above, the jaw-joint in front, or the parotid below; but it should rarely be needful to injure any of these even though we should be forced to expose them. Clean surgery, done without needless brutality, ought to give us smooth and prompt healing. Return of the growth, after its thorough removal, has, I believe, never been observed. The plan of drilling the apparent base of the growth, as a prelude to the chiseling has not favorably impressed me in any case in which I have seen it employed; and the trephine, although theoretically ideal, seems really inferior to the gouge, if the latter is employed in merely shaving away the bone to the base of the growth and undermining it by gentle persistent work, which may be compared to that of a segment-trephine, before any leverage or hammering is employed to detach the osteoma.

Very curious and possibly largely different are the chondromata, often with ossifying centres, which have been reported in this situation, especially by J. Orne Green. These sometimes seem to have no firm connection with the wall of the canal, probably because they have reached the limit of growth and by their own pressure have impaired the nutrition of the poorly-vitalized tissues of which they are composed, and have been on the point of spontaneous exfoliation at the time the operation was undertaken. A growth of this sort which I recently removed in my office, felt stony hard before removal; but it offered little difficulty to its detachment by the gouge from the back wall of the canal, with no need of laying forward the auricle and soft tissues, as must be done to

gain good access to the serious cases. The growth proved to be almost wholly cartilaginous, but with a central bony mass like the stone of a cherry, [Fig. 3], and eighteen months observation has shown no tendency for any renewal of trouble after the prompt healing.

The point which deserves the strongest enforcement, however, is the need to seriously regard the presence of even small out-growths in cases of suppuration of the middle ear, since the irritation of the discharge is one of the most probably causative factors in the production of the growth; and the existence of such a discharge or even a well-based suspicion of it, may be one of the best reasons for operative intervention. It seems fair to suggest the rule that in any patients who are not of British birth and who have not symmetrical growths in the other ear, we should assume that there is a suppurative lesion behind an exostosis of the canal and operate to forestall serious trouble more readily than we would in idiopathic cases. And always where we have for any reason removed such a growth, it is our duty to search most scrupulous- and repeatedly for evidence of perforation of the Shrapnell membrane or minute fistula at some other point as the source of discharge, however little the history may point to such a condition.

DISCUSSION.

Dr. Dench: — I should like to speak of two cases of malignant growth. The point the doctor brings out about the presence of a bony tumor making one suspect a suppurating ear is valuable and we should remember the necessity of operating on these cases to secure free drainage. Sometimes you cannot make a diagnosis of the condition behind until you have removed the obstacle in front. One of the cases of malignant growth I wish to speak of was a fibro-sarcoma, in a man sixty years old where I thought at first there was a simple suppurative

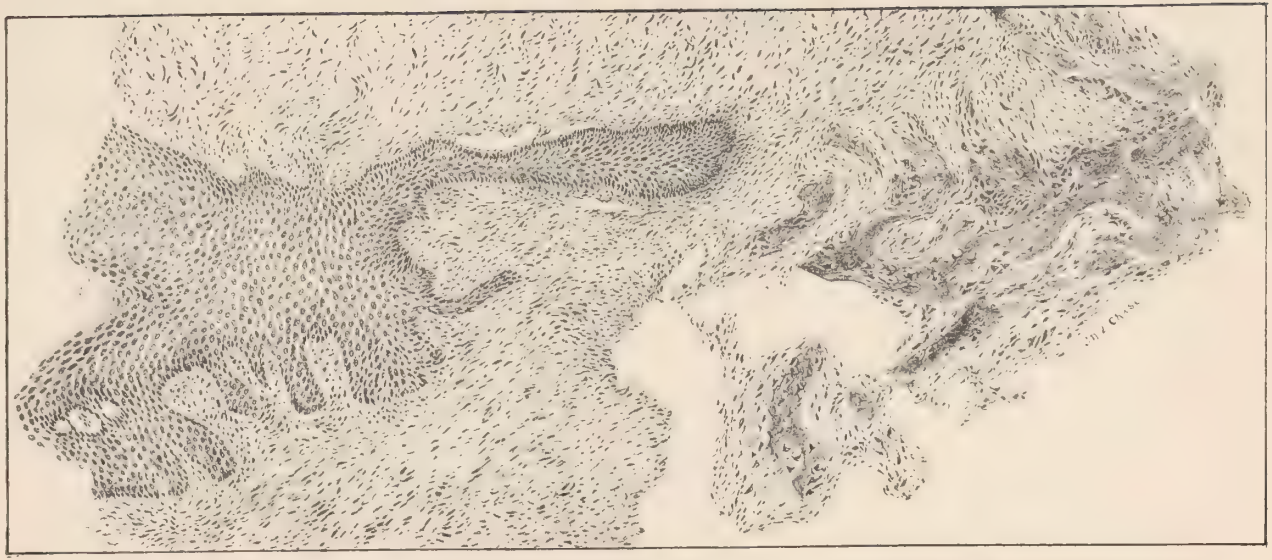


FIG. 3. Section of Ossifying Chondroma of External Auditory Meatus. The solid bony center has been lost, but the ossifying trabeculae pass out through the fibro-cartilaginous mass almost to its irregular cutaneous covering.

condition, or a polyp that had undergone degeneration. A fragment showed fibro-sarcomatous tissue. The entire growth was examined after operation so that there was no doubt as to the nature of its structure and yet recovery was good.

Another case was that of an infant eight months old, who came into the Hospital on account of a discharge from the ear. The external canal was filled with a neoplastic mass and there was a slight discharge from the canal. I did a mastoid operation and found that the growth had perforated the mastoid cortex. The dura was exposed for a considerable area. The growth was curetted out as thoroughly as possible and the wound healed pretty well. The growth recurred and the ultimate outcome was death. In the first place, when the child first came under observation the thing that made me suspect that it was a neoplasm was that the child had a paralysis of the external rectus muscle. This had come on early and persisted throughout the entire course of the disease. It improved a little after operation and then returned and never disappeared entirely. Another interesting feature was that at one time the child left the dispensary for a number of months and was treated by the X-ray and temporarily it seemed to improve the condition. The posterior wound which had not healed completely when the child left did heal completely under the X-ray and when the child came back it had a large tumor, but no breaking down. I then tried to diminish the size of the growth by tying the carotid artery, but it had no effect and if anything the tumor grew more rapidly. Ultimately the structures in the throat and naso-pharynx were involved.

Dr. Pooley:—I would call attention to the use of erysipelas toxine in treating malignant growths. My mind reverts to this by Dr. Randall saying that erysipelas existed in two of his cases. A case of extensive epithelioma involving the mastoid where operation was

followed by speedy relapse and in a second operation made for relief of the recurrent growth the patient had an attack of erysipelas and although that second operation was made many years ago the epithelioma has never returned. A similar case was brought to my attention by a colleague in New York; a sarcoma involving the structures at the angle of the jaw and with a number of glands sarcomatous in character. After the first operation there was a relapse. In the second operation the wound was invaded by erysipelas and there was no return of the growth. In view of what has been written by Dr. Coley as to the effect of the erysipelas serum in such cases this is of interest.

Dr. Reik:—I should like to add a word as to hyperostosis of the external auditory canal. If I understand the doctor's position, he recommends operating on these cases much more frequently than is advised in the text books and I am glad that the advice comes from so high an authority as Dr. Randall. Two years ago I published a paper on this subject in the Bulletin of the Johns Hopkins Hospital Medical Society, setting forth the literature on the subject and pointing out the fact that practically every text book published followed the law laid down by Toynbee many years ago that they should not be operated on unless there was immediate danger from a suppurative process behind the neoplasm, or unless the hearing in the other ear was affected. This was well enough in the days of Toynbee perhaps, before anesthetics and antisepsis were known, but there would seem to be no reason for continuing to hold that view, and yet every text book continues to repeat that old law.

Dr. Holmes:—I am very glad to have heard this paper of Dr. Randall's, and I must say that I believe, as the doctor states, that early operation would as a rule be an advantage. About a year ago I saw a splendid specimen of a man, who had a double exostosis, which had nearly met in the external canal, and an attempt had been made

by a colleague to remove these through the meatus. He found them very hard, removing only the tops, and set up an otitis media and perforation of the drum. The patient, a commercial traveler, went about the country treating the ear as he went. The operation had only irritated the growth and there was rapid closing of the canal, so that the secretions were retained, and he suffered severely from headache and pain. He then came to me for an operation, which I made, detaching the auricle. I tried the chisels, but found the growth so hard that only the drill could be used and as the growths were directly aganist the annulus great caution had to be used in order not to injure the membrane tympanum. It took me about one and a half hours to complete the operation. His recovery was prompt. The otitis media following the first operation improved rapidly, and he was permitted to leave the hospital and come to office for treatment after ten days About three weeks after the operation he desired to take a business trip up the state. I allowed him to go, but told him to return at once if there were any untoward symptoms. On the third day he caught a cold and had a severe chill in the evening before retiring. Four days afterwards his wife notified me that he had been in bed that length of time and that he was probably going to die. I took the first train to see him, and found him under the care of three physicians. The symptoms clearly pointed toward meningitis, and he was moribund when I arrived. I told them he would certainly die in a very few hours, but as a last resort I would operate. The operation was made without an anesthetic. I found thin pus in the mastoid cells, but could detect no special inflammation of the meninges; made punctures in various directions, but found nothing. He expired shortly after being put to bed. We made a post mortem the next day and found bassilar meningitis.

Dr. Bacon: — The doctor referred to sea bathing as a cause of exostosis. I have been particularly interested in

that point because in almost every case I have seen a history of frequent sea bathing has been given. In every case observed in recent years I have asked the question and found that as a rule, the patients indulged in sea bathing.

Dr. Blake:—The theory of sea bathing as a cause of exostosis was the original idea of Prof. Wyman, who found these exostoses so frequently in the Hawaiian Islanders and concluded that it was due to their habit of sea bathing.

With regard to the later investigations on the subject there seems to be a bearing of heredity on the cases of exostosis, some instances having been reported in the literature. I have had some cases where it occurred in three generations in succession.

Dr. Randall:—I am glad that my desultory remarks have brought out some discussion of the subject, which is worthy of a better paper and better discussion than I am now able to give it.

ELECTROLYSIS OF THE EUSTACHIAN TUBE. A FURTHER REPORT.

THOMAS J. HARRIS, M. D., *New York, N. Y.*

In 1901 the writer had the honor to present before another society a short paper which embodied a year's clinical study with the electro-bougie. This method of aural therapy was at that time comparatively new although it had been introduced previously in Europe and before that by Newman in this country. It is, however, due to Duel, who in 1899 recommended its use, with certain important modifications in the technique, that it became known in America.

Duel's results with the method were so satisfactory and his claims so enthusiastic that we were all incited to attempts at imitation. Unfortunately our own conclusions as set forth in this paper were not so favorable.

Since that time the procedure has been tried by a goodly number of otologists, and several critical contributions have appeared, including one by Pierce and more recently a second paper by Duel which shows, it seems to us, a somewhat more conservative attitude but still a high amount of confidence in the value of the method in suitable cases. During the past three years we have continued our study of the method and as the result of such increased experience, feel we are justified in a further brief consideration of certain questions in connection with the method which must suggest themselves to every thoughtful investigator. First, what, as a result of our personal experience, seems to be the real value of the method? In our original paper we drew from our analysis of some seventy-five cases carefully tested the conclusion, that

"the electro-bougie has a place in our aural therapy, though a less important one than was at first supposed." Our later investigations lead us to regard this as a very fair statement of the situation. The indications for its employment are now well defined. We know that it is utterly valueless in cases of oto-sclerosis and indeed whenever the tuning fork shows involvement of the internal ear. Indeed the use of electrolysis is distinctly limited to those cases of hypertrophic otitis media with characteristic associated narrowing of the Eustachian tube. In a certain number of such cases we are able to give relief to the tinnitus or vertigo and less often to improve the hearing. Unfortunately the large number, in spite of careful selection (and this is of course essential to any hope for success) and patient application of the method, do not so improve. According to Duel's own figures, out of fifty-eight men who reported using the method (twenty-eight extensively), over forty per cent. gave it as their candid conclusion that it was of no real value.

Further, our primary investigations showed what has been borne out by the study of subsequent cases, *i. e.*, that the early beneficial results are too often only temporary and no lasting improvement is realized. That such should be the result a few moments of reflection will show to be but natural. Granting that the most careful treatment has been addressed to the nose and throat and every irregularity of the upper respiratory tract been reduced, no amount of ventilation of the middle ear can hope to effect the organic changes which have already taken place in chronic cases. The most that we can hope to accomplish is in a comparatively recent case of otitis media with swelling and narrowing of the Eustachian tube to restore it to a patent condition. This, because of the possible dangers which are liable to arise from the application, should in our judgment only be undertaken when the ordinary celluloid bougie under gentle but persisten use has failed to enter the tympanic canal.

The Dangers.—Granted now that there is a field for the electro-bougie, though a limited one and that in a certain percentage of suitable cases the results are even permanently beneficial, what shall be said as to the corresponding disadvantages which may render the procedure an unwise and unsafe one?

In the article previously referred to, we stated that "its use is not without danger," and a proper knowledge of the anatomy of the parts and of the technique is essential. Further experience both by ourselves and by others, has abundantly justified this conclusion. Duel, as a result of his letters of inquiry, learned of thirty-three accidents of various kinds. These were from the experience of fifty-eight operators only, representing the pick of specialists in this country. How many accidents occurred at the hands the hundreds of the unskilled, incompetent, six-weeks specialists scattered over the land, we will never know.

These accidents may be conveniently considered under the heads of

a. Sepsic.
b. Traumatic.
c. Electrical.

a. A number of cases were those of acute otitis. These were probably due to imperfect antisepsis. It is a *sine qua non* to any attempt to employ the treatment that everything used, including catheters and bougies, be carefully sterilized. Even with the most careful preparations we question if it is always possible to secure complete asepsis. In our reported case of acute suppurative otitis, followed by mastoiditis, we are confident every precaution was exercised. Certain it is that with the ordinary bougie no such accidents are wont to occur. It has suggested itself to us that there was a previous presence of bacteria in the tube, which only needed an open wound caused by the bougie cutting the mucous membrane to excite inflammation.

b. Traumatism. — Sepsis is not, however, the only condition to guard against. Nine cases are reported of breaking off of the bougie in the Eustachian tube. This is a most serious accident and has occurred in the hands of the most skilful operators, when least expected. A further form of traumatism is wounding of the mucous membrane. This is intimately associated with the third form of accident, namely, those the result of the electric current itself.

c. In order to properly appreciate such lesions we must consider the nature of the electric process. Electrolysis, if we understand it correctly, means the dissolving of the tissues into their component parts by means of the electric current, with the escape of free hydrogen. Such it has been claimed is the action of the gold bougie in the Eustachian tube. In our original communication, we stated that to our mind it is a question whether the process is a true electrolytic one. Further reflection during the past three years has only served to strengthen this doubt. There is little question that three forms of electricity may be introduced by means of the bougie; first, galvanism; second, electrolysis; third, falvano-cauterization. It is our firm conviction that many of the temporary beneficial results are due to galvanism acting on the Eustachian tube and the middle ear. No amount of reasoning can convince us that when in two seconds a seemingly impassable barrier gives way, as it often does under the electro-bougie, a true absorption of tissue has taken place; rather has there resulted a stimulation or contraction of relaxed or hypertrophied membranes. We must not fail to recall that this occurs with a current of one to three milliamperes, which is not concentrated at the end of the bougie but scattered over its entire surface. In direct confirmation of this we know such apparent strictures are often found reformed at a subsequent visit. It is further true, as Dench has pointed out, that many seeming strictures are only rugae or folds of mucous membrane

which may be passed with ease by giving the bougie a different curve. And it is doubtless true that many times the brilliant passing of such strictures is merely a plunging through this mucous membrane. Where higher degrees of current are employed there is always grave risk of producing cauterization instead of galvanism or electrolysis, and we possess no rule when we can definitely say such limit is reached. Any burning is bound to be followed by subsequent adhesions. This we regret to say we inadvertantly gave rise to at the pharyngeal mouth of the tube in a patient suffering from a stenosis of the Eustachian isthmus, where no obstruction in the pharyngeal end had previously existed.

Similar cicatrices not located so as to be seen by the examining mirror are in our opinion, constantly wont to occur in the hands of those who use the electro-bougie, and this danger is continually to be borne in mind.

We would regret to be misunderstood in what we have said. We have endeavored to state our position in an entirely unbiased manner. As a result, however, of our previous investigations reinforced by further observation and study we are forced to the following conclusion.

First. That there is a certain degree of value in the method, in a relatively small number of carefully selected cases, notwithstanding that in the hands of many operators it has proved a disappointment not merely in its immediate results but much more in its permanent effects.

Second. The method has shown itself to be attended with no small degree of danger and accordingly should be employed only after every other means of establishing the patency of the Eustachian tube has been tried and failed, not as a quicker, easier way of doing this without resort to other means.

The most scrupulous attention to antisepsis is essential and the greatest gentleness as regards current and touch. Indeed, we would go further and say it is a procedure

which requires the manipulation and skill of an expert in its introduction; not every one who provides himself with the apparatus and can bougie the Eustachian tube is competent to carry it out.

Finally. In the majority of cases the process is not a true electrolytic one.

DISCUSSION.

Dr. Dench:—I have been very much interested in this paper as I am in the whole subject of the use of bougies in the Eustachian tube and I came to the conclusion quite a number of years ago that Dr. Harris has arrived at in his consideration of the subject; that the electrolytic method offers us a good means of carrying out a certain line of treatment that can be generally done as well by simpler methods.

There are one or two things to which he called attention that I would like to speak of. The doctor said he thought the use of the bougie limited to the cases where there is obstruction, or narrowing. Certain cases have been reported where improvement has followed in a tube that was very open, and, it seems to me there is one possible use which should be borne in mind, and that is of the galvanic effect referred to by the doctor. We sometimes get a stimulation of the vaso-motor nerves, that may exert a very good influence on a persistant tinnitus. So I believe that the use of the electrolytic bougie simply as a means of applying the galvanic current may be of benefit in certain cases. The simple bougie also has a place here. Urbontschitsch recommended this method of stimulation by what he called massage, by passing the bougie and moving it backward and forward. There is in this way a certain amount of mechanical stimulation produced and cases have been reported by some men where a very good effect has been observed.

The doctor says it is more prone to cause suppuration than the simpler method; I do not think so. I know of one case in which I caused an acute otitis media, by the use of the simple bougie. I think the dangers are about equal so far as sepsis is concerned. If the instruments are boiled thoroughly I do not think there is much danger from that source.

The doctor speaks of the apparent giving way of a barrier in cases of stricture as one of the evidences of the electrolytic action as given by Duel and other authors. I quite agree with the doctor that the fact that the barrier gives way does not prove that it was broken down by electrolysis. Firm pressure with the simple bougie may give exactly the same sensation to the manipulating finger as does the passage of the electrolytic bougie through a small obstruction. The doctor has stated in a very concise manner the position of electrolysis.

Dr. Bacon: —I am glad that Dr. Harris has arrived at the conclusion that electrolysis should not be used until every other method has been tried. It has seemed to me that the ordinary bougie is very much safer. You can tell very much better where the point of the instrument is going and it is on that account a more desirable method of treatment. Many writers have referred to the use of electrolysis as a means of relieving tinnitus in certain cases, but we should not lose sight of the fact that in a certain number where this method has been employed tinnitus has followed which has not been temporary but permanent in character so that before resorting to the use of any form of bougie we should remember that we may cause a tinnitus in patients previously free from it.

Dr. Holmes: —After seeing Drs. Harris and Phillips use this method, I ordered a complete outfit and used it in a number of cases. On about the fifth or sixth case I had an accident, losing about three fourths of an inch of the gold bougie in the Eustachian tube. (I had used the instrument on the same patient three or four times before

the accident occurred.) I made a rhinoscopic examination, but was unable to see the end of the piece in the mouth of the Eustachian tube. The patient was not aware of the accident, but complained of a sensation of fullness and increased roaring in the ear; watched her with a great deal of anxiety, seeing ahead of me a possible mastoid operation, to remove the piece. The unpleasant symptoms subsided rapidly, and on the third day I attempted to introduce a whalebone bougie in the tube, but encountered the foreign body. In a few days I again attempted to pass a bougie and found to my greatest relief that the foreign body WAS NOT THERE; in some manner it had worked out without her knowledge, and in no way damaged the ear.

DR. DENCH: — Speaking of the breaking off bougies, my chief of clinic had an amusing experience in that line. In a patient that he was examining he saw something shining behind the drum membrane and took out three gold tips from this one patient.

DR. HARRIS: — In closing I just want to say one or two words in reply to Dr. Dench. It may be in Dr. Dench's hands a wise procedure to increase the indications for the use of the bougie to the dilated tube, especially if one proceeds not on the theory that he is going to relieve anything there, but that he is giving galvanism to the middle ear, but I have not met such cases in my experience and while I bear in mind one or two such cases reported by Dr. Dench I think he has in his later papers cut out such indications. I myself feel that it should be restricted to those of obstruction and not used for the dilated tube.

As regards suppuration following the ordinary bougie it is also true that the reported accidents do not approximate the number that have followed the use of the electrolytic bougie. Of course infection may be carried in with the whalebone bougie, but generally such results have been avoided.

As to breaking off the gold bougie, a most important

point I think is to be very careful about the quality of gold in the bougie and to be sure it has not been worn thin by previous continued use. However in the cases where breakage has occurred there have been no very serious results as far as I know. Dr. Tansley reported such a case two years ago where he extracted the broken piece, but it does seem that the great trouble we might anticipate from the broken portion has followed.

MIDDLE EAR TENSION, OR PRESSURE ABNORMALITY, AS A FACTOR IN THE CAUSATION OF AUDITORY VERTIGO.

CLARENCE JOHN BLAKE, M. D., *Boston, Mass.*

That the condition of the sound transmitting apparatus of the middle ear plays an important part in the causation of vertigo is liable to be overlooked in the consideration of the other, reflex, factors in any given case but a study of the vague, recurrent vertigoes, as they come under the care of the neurologist, gives increasing evidence that some form of fixation of the sound transmitting apparatus of the middle ear constitutes the constant factor, and some degree of suspense of vaso-motor inhibition the variable factor, in the majority of them.

Aside from the precautionary provisions against undue disturbance of the ampullar end apparatus, mechanically considered, and those made in the circulation supply to the labyrinth itself, there are the compensatory provisions permitting gross movement of the intralabyrinthine fluid, among which are to be estimated the movement outward, primarily of the membrane of the oval, and secondarily of the membrane of the round window, the former favored by the constant lifting traction of the stapedius muscle and the latter by the minimized air pressure of the tympanic cavity.

Given a fixation of the stapes, either individually or through the medium of the other members of the ossicular chain, a portion of this compensatory provision against intralabyrinthine pressure resulting from a suspense of vaso-moter inhibition, is lost, this loss varying in its extent with the degree of stapes fixation, from that pertaining in the simple general immobilization of

chronic nonsuppurative disease of the middle ear, to that attending the supreme fixation, by bony anchylosis, of the stapes itself.

The production of vertigo, by stapes impaction of traumatic origin, by persistent pressure upon the stapes, bearing inward, from cholesteatomatous accumulations or granulomata and, more rarely, that resulting from the transmission to the stapes, through the medium of a depressed cicatrix, of the normal atmospheric pressure, are all examples of the effect upon the peripheral organ of equilibration of intralabyrinthine pressure of extrinsic origin, while the relief from the vertiginous symptoms, incident to the removal of the extrinsic cause, is sufficing evidence of the correctness of the conclusion drawn.

In is in the minor degree of loss of mobility in the sound transmitting apparatus of the middle ear that the determination of the extent to which this condition is responsible for the recurrent vertigoes is most difficult, a difficulty solvable in part only by the process of elimination which restores, as nearly as possible, the mobility which has been lost, at the same time taking into due consideration the character, and causation of the vaso motor disturbances which constitute, as it were, the other end of the induced pressure process of which the middle ear apparatus is the outermost factor.

Given a certain degree of fixation of the middle ear apparatus, with corresponding resistance to pressure exerted upon it from the labyrinth outward, it is understandable that intralabyrinthine pressure from abnormal increase of intralabyrinthine circulation, against the effect of which the normal mobility in the middle ear is intended, in part, to provide, will produce the familiar train of symptoms of which vertigo is one, and it is equally understandable that no case of this kind can be justly dealt with without proper estimation of the force value of both its extrinsic and intrinsic factors, and it is safe to say that the great majority of cases in which

vertigo is a prominent symptom, and especially the recurrent vertigo of sudden onset, should be viewed from the otological as well as the neurological standpoint.

In the cases of recurrent vertigo, seen sometimes in otherwise strong and well ordered individuals, both the observations set forth in the literature of the subject and daily experience show, in the great majority, an abnormality in the ear, ranging from a simple middle ear fixation to the consequences of a past intralabyrinthine hemorrhage, constituting a persistent intralabyrinthine pressure to which the end apparatus has become, gradually, accustomed, being stimulated to further, abnormal, activity only by the additional pressure incident to intralabyrinthine suspense of vaso-motor inhibition of reflex origin.

A familiar type of these cases is that in which the attacks are the sequence of cumulative overtire or emotional fatigue or the effect of undue use of stimulants or depressants and in which there is found, upon examination and hearing test, some distinctly causative, more or less persistent, abnormal aural condition.

As briefly illustrative examples of the aural conditions, of non-suppurative origin, which play a part in the causation of the, so called, auditory vertigo, may be cited, the cases of chronic progressive middle ear thickening with marked secondary retraction of the tensor tympani in which protracted use of the plugging process of Politzer has, in a measure, relieved the fixation, improved the hearing and been followed by relief from the vertiginous attacks; the cases of stapes fixation in which mobilization of the ossicular chain, consequent upon an exploratory tympanotomy, has procured similar relief; the cases of stapes anchylosis, is which removal of the stapes has substituted, in the oval window, an elastic membrane for the resistance of the immobile bone, and, finally, the cases of intralabyrinthine hemorrhage, in which, in default of tapping the labyrinth itself, the

principal remedial measures have been directed to the prevention of the reflex causation of the attacks.

In view of the extensive changes wrought in the middle ear by a prolonged suppurative process, the formation of multiple cicatrices, the tying down of normally movable parts by adhesion, and the thickening of remaining tissues, it might be supposed that these conditions would furnish a large number of the aurally causative cases of vertigo; that such is not the case is due to the marvellous provision which nature makes here, as elsewhere, for the safeguarding of important parts and vertigo as a sequence of a past suppurative middle ear condition is as rare as is the extreme anchylosis of the stapes.

Where vertigo does occur the study of the existing condition in the middle ear, in a search for the probably causative factor, is a most interesting one, especially as, when found, there is the possibility of an immediate surgical remedy at hand. The relief afforded by the excision of a cicatrix enclosing the round window, or through release of the stapes by tenonotomy of the stapedius, with the subsequent introduction of an artificial drum-head are examples of this. The stretching of a large cicatrix in the posterior superior segment of the drum-head will sometimes bring to bear directly upon the stapes a degree of atmospheric pressure sufficient to cause vertigo, when coupled with the pressure of an increased intralabyrinthine circulation and the extrinsic pressure may be relieved, and the use of the cicatrix for sound transmitting purposes be conserved, by repeated painting with contractile collodion which serves not only to lift the cicatrix but ultimately to restore it to its former tension.

In point of fact the investigation of the possible aural causes as partial factors in the production of the, sometimes apparently mysterious, and often alarming symp-

tom of vertigo, is one of the most fascinating studies in otology.

DISCUSSION.

Dr. Dench:—This paper, I think, merits a great deal of discussion. I have been very much interested in these cases of vertigo and would like to ask Dr. Blake if where he finds a vertigo due to some tension in the middle ear he does not also find frequently, by tuning fork examination, evidence of a labyrinthine disturbance? I have met with cases of vertigo where there was a narrowed tube, but where it was not narrow enough to account for the vertigo entirely, in which middle ear treatment has temporarily given relief. In all these cases there was diminished bone conduction showing a labyrinthine disturbance, and, in these cases I have found that pilocarpin in full doses to relieve the labyrinthine pressure gave good results. I recall one particular case where the patient was in the hands of a specialist on diseases of the stomach for a year and a half and was subjected to a very thorough course of treatment along that line. The attacks ceased only upon local treatment of the ear, with the internal administration of pilocarpin. There has been no attack now for two years. That case I remember particularly because, as I said, the symptoms were very marked, but I have had a good many others where vertigo less severe has been relieved by the same plan of treatment. There is one plan of treatment suggested by Dr. Blake some years ago which was in one case followed by good results; that is where we have a relaxation of the malleo-incudal articulation which the doctor spoke of as a potent factor in the cause of certain cases of tinnitus. When I saw this case the symptoms caused me to think the vertigo might be due to that cause. He noticed the vertigo when lying down and suddenly turning to one side in such a way that the malleus dropped away from the incus. I tried the

little paper splint suggested by the doctor to push the malleus upward and backward against the articular surface of the incus. Then finally instead of using the paper splint I used the rubber dam. The patient was entirely relieved by this method.

It seems to me we find a certain number of cases of vertigo following suppurative disease and I remember one case where the relief was permanent by dividing adhesions about the oval window in the region of the stapedius muscle. I have seen quite a number of such cases. I think the subject is most important and interesting.

The doctor did not speak of cases due to narrowing of the Eustachian tube. There you find the classical symptoms of obstruction to the conductive apparatus and do not find the symptoms of labyrinthine disturbance.

Dr. Kipp:—I have found that in the cases due to changes caused by chronic suppurative trouble of the middle ear adrenalin did very well indeed. I have given it also internally in some of the cases. Although the effect may not be permanent it is temporarily good, showing that the condition is sometimes probably due to vascular disturbance.

Dr. Bacon:—I think there is too great a tendency at the present on the part of the general practitioner to attribute vertigo to the ear when it may not properly belong there, and I believe that sometimes too much stress is laid upon the ear condition in these cases. I have a case in charge now referred to me by a prominent man as a case of Menèire's disease. The patient has not any of the symptoms of that disease except the vertigo. The Eustachian tubes are pervious and the appearance of the drum membrane is exactly the same on each side. Whether the ear has anything to do with the trouble or not is a difficult problem. I think perhaps neurologists too frequently refer these cases of vertigo to the aural surgeon.

Dr. Fryer:—I should like to ask Dr. Blake how long he would think it safe to carry on the adrenalin treat-

ment? I use it, but am careful not to employ it in very elderly people. I recollect seeing in one of the German Journals a report of experiments in the production of arteriosclerosis in animals from adrenalin.

Dr. Blake:—I referred only to its use in the vertigo spoken of, not in tinnitus.

Dr. Theobald:—I want to add a word as to the causes of so-called aural vertigo. My own experience is that these obscure cases of vertigo are perhaps as often referrable to ocular troubles as to aural ones. When a patient comes to me with vertigo, I am quite as apt to think of the eyes as of the ears. Of course, I inspect the ears, but I meet with a considerable number of these cases where the trouble is with the eyes, and where it is completely relieved by the correction of astigmation, or muscle imbalance by means of a tenotomy perhaps, or by correcting glasses. Not only have I met with cases of vertigo due to this cause, but I have encountered a limited number of cases of tinnitus aurium due to eye strain. Only a week ago I heard from a patient in whom I had not only corrected a marked astigmatic error but upon whom I had done a tenotomy, and one of whose annoying symptoms was tinnitus aurium. After the tenotomy and adjustment of the glasses the tinnitus disappeared. A few weeks ago she complained again of the tinnitus. I went over her refraction, modified the glasses and prescribed bifocal lenses. She fought against the bifocals and did not wear them, and she still complained of the tinnitus. I told her that it would persist probably until she put on her glasses and wore them. A few days ago I had a letter saying that she had been wearing the glasses and that her tinnitus had entirely disappeared. I have met with a good many instances of this kind, and I would suggest to our strictly aural friends that they should bear in mind the possible influence of eye strain in cases of this character.

Dr. Randall:—I have myself written upon the use of adrenalin and particularly as to its value in restoring con-

fidence in a patient who cannot lift the head from the pillow because of the fear of an attack of vertigo. They find that they can avoid this feeling of sea-sickness by taking a tablet triturate of adrenalin before rising and that they are then able to get up and go about their work. It has worked very happily in some of these cases.

Dr. Theobald: — In what doses?

Dr. Randall: — Doses of $\frac{1}{200}$ of a grain, or two or three grains of the extract when I want a slower and more persistant effect.

Dr. Blake: — These observations had reference to recurrent vertigo and not to persistent vertigo of which Dr. Theobald has spoken. It has always seemed to me that these recurrent vertigoes, the attacks coming on in people ordinarily strong and well, had two factors of causation; a more or less constant tension or that coupled with the suspension of vaso-motor inhibition manifesting itself suddenly as a result of accumulative effect. One case I have in mind; a man, who in childhood had had a suppurative middle ear disease, in both ears, with perforation of the drum-head. Finally the discharge ceased and there was closure of the perforation with cicatricial tissue. When I first saw him he had noticed for some time past a sense of fullness and an impairment of hearing. More recently he had noticed with increase of the sense of fullness and tinnitus slight attacks of vertigo, which were relieved by valsalvan inflation. He had been treated by his family physician until his digestive apparatus had been pretty thoroughly cleaned out, but I found that his attacks came on irregularly at intervals of three days or two or three weeks and always at the close of his day's work and that they were much more apt to occur when he was feeling tired. On examination of the ear I found the cicatrices in both ears depressed; that in the right ear being particularly marked, clearly revealing the head of the stapes and outstanding process of the incus.

There was considerable impairment of the hearing and increased hearing by bone conduction. Inflating the ear gave the patient a sense of relief from his fullness and tinnitus and marked improvement in hearing. Within two hours the cicatrices would sink back to their former position with recurrence of the fullness. The relaxed cicatrix was then painted with collodion and finally in this way the scar was brought out level with the drum-head. Then he had improved hearing for tones of low pitch and relief from the sense of fullness and tinnitus and while the cicatrix was kept in this position he had no attack of vertigo. For experimental purposes the scar was allowed to fall back into position when he again had his attacks of vertigo coming on without warning except a feeling of growing fatigue. The case was left three weeks without any treatment to test the matter and then treatment with the collodion was resumed and continued until the scar was restored to a proper degree of tension. For the last three months, with the scar in that position, he has had no vertiginous attacks.

THE PROLONGED TREATMENT OF CHRONIC SUPPURATIVE MIDDLE EAR DISEASE IN ITS RELATION TO RADICAL OPERATION.

CLARENCE JOHN BLAKE, M. D. *Boston, Mass.*

The question of the prolonged, non-radical operative, treatment of a protracted suppurative process in the middle ear, unless there are concomitant symptoms indicating major operative procedure under general surgical rules, is one not of time, but of the static condition of the individual, and into this consideration must come not only the influence of the persisting middle ear condition upon the present welfare and future safety of the subject, but the possible hazards and effects of the major operation, and the possibilities of its avoidance by other substitute measures, however protracted.

In the face of a protracted suppurative process in the middle ear, the natural temptation, in view of the modern facility and safety of operative procedure, is to get, as directly as possible, at the seat of the offense and by effacing cleanse it, but it is far more easy to operate than to judge; the radical operation has been so clearly defined by a large experience as to present, in itself, no difficulties, the period of after treatment, as the fruit of various suggestions, has been steadily decreased and, due caution being presupposed, with safety, celerity and the prevention of possible future disaster in its favor the tendency, as a matter of course, is to apply it, with its prestige as a final remedy, when, sometimes it may not be absolutely required.

Between a radical operation and a prolonged treatment of the middle ear including ossiculectomy, and access to

all parts within reach through the external auditory canal, the question is one of choice in which the surgeon must decide for the patient since the patient has no adequate ground upon which to come to a decision for himself and into this consideration should come, except in cases of emergency, not only a careful and deliberative study of conditions but also the tentative application of such remedial measures as may afford relief without major operation. The duration of this investigatory treatment can be determined only by the existent conditions in the individual case and the attempt to fix a statutory limit is open to the objections which attend the promulgation of a sumptuary law.

One of the results of the growing frequency of the radical operation will be that in time, as the result of experience, it will take its proper place as a valuable, necessary measure, but this will not be until both its value and its necessity have been more clearly defined and until the comparative value of what may be called the middle ear treatment, now fallen somewhat into desuetude except as a preliminary measure, has been not only further defined but improved.

The room for improvement in this respect is illustrated in any of the large aural clinics where the paucity of middle ear operations in suppurative middle ear disease is noticeable in its contrast to the general growth of aural surgery. The large mass of material to be handled makes the surgical short cut to relief almost a necessity but it leaves to one side much which, lacking consideration, constitutes a distinct loss to the progress of otology.

One of the important preliminary considerations which shall help to the decision as to the necessity for the radical operation is the determination of the main source of the suppurative discharge, whether it is antral, post antral, mainly from the epitympanum, including a carious process in the ossicles, or whether, if spontaneously ceasing and frequently recurrent, it has its source in

successive reinfections from the Eustachian tube, in which latter case the utilization of the anterior portion of the drum-head, properly dissected from the periphery and turned inward upon a previously curetted surface, may be made to close that channel of contamination and favor the dermatization of the exposed middle ear surfaces. The removal of the two larger ossicles, when the discharge comes from the epitympanum, may be regarded as absolutely necessary for, if not themselves diseased, they are an obstruction to access and to drainage; in all cases, when there is a sufficient remnant of drum-head, it is preferable to dissect them out leaving the drum-head remnants with their good blood supply for utilization; the attachment of the ossicles to the epitympanic walls should also be made the subject of dissection, the stapedius tendon should be divided in order to free the stapes for future use and the whole epitympanum should be carefully curetted and dryscrubbed. Should the discharge prove to be antral in its origin it is advisable in addition to the procedures mentioned, to remove the outer epitympanic and antral wall, through the canal, and thus gain the necessary access for subsequent cleansing and deterrent treatment.

The fact that cases thus dealt with have come, by a gradual dermatization, to cessation of the suppurative process, and that this has been accomplished without interference with the daily course of life and occupation of the patient, even though the treatment has extended over a considerable period of time, is one which has to be taken into consideration in estimating the necessity for the radical operation, while the cases in which the radical operation reveals extensive post antral sources of continued discharge in lines of diseased pneumatic cells extending three, or more centimetres backward from, or downward into, the mastoid, equally prove the futility of anything but radical treatment.

Between these two lines of treatment of chronic

suppurative otitis media, the tentative, which includes thorough middle ear cleansing and the minor operations, and the radical which seeks to reach a conclusive result by means of a post aural opening, lies the question in debate which cannot be settled until both have been more carefully defined than they are at present and this through the exactly recorded results of repeated observation and critical experience.

DISCUSSION.

Dr. Kipp: — In reading the other night a report of a meeting at which this subject was discussed, I was struck with the diversity of opinion upon this subject and a student reading it would certainly suppose that we were all at sea. Formerly we followed the plan of Dr. Blake, but the more modern tendency has been towards operation. Many of these old chronic cases can be made perfectly comfortable. You can get rid of the secretion and have no signs of disease except defective hearing. They go on for ten or fifteen years and then have a recurrence, you treat them a while and they are all right again. In these cases if I had operated, as perhaps I should have done, according to some, would they be any better off today than they are? I think not. In all the radical operations I have done there was impairment of hearing following. I certainly would follow out the suggestion of Dr. Blake to persist with the local treatment, removing granulations and carious bone and using caustics, etc., for a long time before operating, and especially in old people.

I have used recently argyrol a great deal in these cases and with very good effect. Suppuration has stopped in some cases in a week. I had the other day a lady who had been treated by me off and on for the last thirty years. It is one of those cases where the patient goes along for ten years or so very comfortably and then has an acute attack. The last time I treated her I dropped in by acci-

dent pure tincture of iodin, in the external canal, thinking it was argyrol. The discharge ceased at once and has not returned.

Dr. Pooley: — I am glad to have heard this conservative paper of Dr. Blake's. You will recall that at the last meeting in New London I read a short article on the Stacke operation, and, in that paper I followed the same line of argument as Dr. Blake has today. The whole trend of my argument was for a more conservative discrimination in operating and a more persistent trial of other measures before resorting to operation. At the same time I referred to the objections and dangers of the operation. When we consider the dangers of the operation and the long after treatment it is not a short road to the cure of the disease. Some of the cases heal comparitively quickly, but the majority remain under treatment for a long time. Of course the form of after treatment has a great deal to do with it and that is why those who have many cases get quicker healing than a mere novice in the operation. I am certainly very much in accord with Dr. Blake's paper.

Dr. Bacon: — I am very glad that the doctor has brought up this subject as I consider it a very important one and I agree with his ideas and particularly with those of the last speaker, Dr. Pooley. Last winter I read a paper on "Conservatism in Otology" in which I advocated the same course. I reported at that time two cases. They each had had a chronic discharge for some years, which did not give very much trouble; one a neuresthenic woman and the other a lawyer in New York, who could not spare the time for an operation. In both cases, by means of syringing and caustic applications, they were cured and have remained so for a number of years.

I think, as Dr. Blake has said, that we should be particular about establishing drainage, removing carious ossicles, and carrying out our treatment along these lines first while holding the radical operation in reserve for cases

which cannot be cured in that way, or which develop alarming symptoms. But, I have failed to see that there are a great many dangers in this class of cases if they are observed from time to time. It is in our hospital cases that we see the complications and that is what has caused the alarm. I do not know of but one case of brain complication in private practice and that occurred a great many years ago in the hands of a colleague in New York. I think the dangers are very much over-estimated.

Another point brought out in the discussion last winter at a meeting of the Alumni of Bellevue Hospital is that a great many physicians have suppurative trouble of one or both ears and I have failed to convince any one of them of the importance of having a radical operation performed. They are not very much alarmed about the dangers they are running themselves and are quite willing to try the more conservative treatment.

Dr. Theobald: — I want only to add to what has been said that I was pleased to hear Dr. Blake's remarks along this line and also what Dr. Bacon has said. For a great many years I have been arguing and writing in this direction. In my judgment the swing of the pendulum has gone very much too far in the direction of radical measures in these cases. The treatment by simpler methods, as Dr. Blake has suggested, and even by simpler methods than he has described, very often yield satisfactory results. My usual plan is to prescribe a sublimate solution, $\frac{1}{30}$ to $\frac{1}{40}$, which I put into the hands of the patient, instructing him how to use it, and directing him according to the amount and character of the discharge, to syringe the ear once or twice a day. As the suppuration diminishes it is used less frequently. The radical operation does not always bring about the results desired. It may cause a cessation of the suppuration, but leave the patient with a practically useless ear. Many of these cases we know still have quite good hearing and bearing this in mind, as well as the risk attendant upon operation, my

inclination for years has been in a conservative direction, and I am pleased to hear these gentlemen, who have had a much larger experience than myself, commending conservative methods.

Dr. Dench: — I agree with what Dr. Blake has said that it is wise to hear both sides in a question of this kind. The tendency has been perhaps to operate too early in many of these cases. I am usually considered a very radical man, but much is to be said on the other side. Dr. Bacon says he has only seen one case of brain complication in his practice; that is all very well, but it is perhaps because we do not accumulate masses of evidence in private practice as we do in clinical practice. The hospital patients are, of course, more apt to have such complications, but it shows that the danger does exist. I went over the statistics of the New York Eye and Ear Infirmary for nine years to determine the frequency of intracranial complications in middle ear suppuration. Out of every eighty-eight cases of middle ear suppuration, one case had either a sinus thrombosis, an epidural or brain abscess or a meningitis. These were the statistics in a period covering nine years; one such complication in every eighty-eight cases. So I think we have in this condition a real danger not to be ignored. The chairman will remember a case he saw, finally operated on by a colleague in New York, where anyone would have said the disease might be cleared up by the method spoken of today. At the operation the dura was exposed over an area the size of a quarter of a dollar. All that was needed was a little neglect on the part of the patient and an intracranial complication must have followed. I have operated where there was no symptoms except cholesteatoma and found exposed dura. While I agree with Dr. Blake that sometimes perhaps we operate unnecessarily, it is a nice point to judge when and when not to operate. One point that should be emphasized is the age of the patient. I operated on a gentleman of forty very successfully this winter and he imme-

diately sent a relative of sixty to me with a history of suppurative otitis ever since she could remember. I let the woman of sixty go. One must use his judgment in this matter. This patient had a large opening with a piece of cotton forced away down into the cavity. I removed that and got free drainage. Now I would not advise that patient to be operated upon, while in a patient of forty I would advise the operation for the same condition, because the chances of some complication intervening would be much greater.

With reference to recurrent attacks there is one point not mentioned, and that is, that these recurrent attacks frequently occur as a result of some infection of the nose or nasopharynx. That is particularly true in children. Where there is a large perforation we get a reinfection every time the child takes cold. These cases will clear up if the enlarged tonsils or adnoids are removed or the nasal condition dealt with surgically. This is a class of cases in which the radical operation should be reserved until the last.

I agree with Dr. Blake in what he has said about ossiculectomy in these cases. I read a paper in Philadelphia a couple of years ago discussing that subject and advocating that method in certain selected cases of suppurative trouble. The results given there were as accurate as I could give them. Since then I have seen two cases which I reported as cured in which discharge has returned. That is the trouble with ossiculectomy; I think the danger of recurrence after ossiculectomy is much greater than after the radical operation. Later we are obliged to subject our ossiculectomy cases to the radical operation, or at least a good many of them. Another objection to the removal of the ossicles as a means of cure is that it does not offer a means of drainage for the hypotympanic space and there we often find a little area of soft bone which keeps up the suppuration.

I am glad to hear Dr. Blake's method of turning in the

drumhead. It is feasible where you have enough of it, but often you have not. There I would suggest what I have followed in one case; I simply took a skin graft and put it in through the external canal and held it in place by cotton pledgets. It closed up the Eustachian tube perfectly. I think this can be done readily in many cases.

As to the effect upon hearing in these cases, I felt exactly the same as most of the men do until I went over the statistics carefully. In ninety-eight cases of mine in only two was the hearing worse; in quite a number it was improved, while in the majority it remained the same. The records were gone over very carefully, and in only two cases was the hearing worse.

Dr. Pooley alluded to the dangers of the operation; I presume he meant paralysis. Out of ninety-eight cases I have not had a case of permanent paralysis. In the majority of cases it only persisted a few weeks. In about four per cent. there was a paralysis at the time of operation which cleared up in a few weeks. In only one case did it last a year.

The time of healing after the radical operation renders it, as Dr. Pooley has said, not a short cut to cure. It takes them some time to get absolutely well, but one point that is of interest to me is this, a certain number of the cases disappear entirely from the hospital after fous or five weeks, while there is still considerable discharge; they come back in three months and the ear is as dry as a bone. They do better than the cases we keep under close observation. If you use cleanliness the cases must get well; they cannot do anything else. Perhaps we sometimes subject these cases to too much treatment. The shortest case of healing, I have had was two and a half weeks and the longest three months. I use a primary graft at the time, or put in a secondary graft ten days later.

Convalescence after ossiculectomy is not always rapid either. I think it is rather longer than after the radical

operation. It seems to me that this subject gives us great food for thought.

In reference to the results; in ninety-eight cases complete cure resulted in only seventy-one; in only five cases the discharge was profuse after operation. In five per cent. then the operation was not successful. In seventy-one cases the cure was absolute. In sixteen of the other cases there was a little moisture three months after the operation. We have to bear this in mind also in advising the operation. We cannot say it is an absolute cure. Whether with improved technique we may get our cures up to one hundred per cent. I do not know. Certainly in over seventy per cent. a cure can be expected; in twenty-five per cent. you can promise great improvement, while in five per cent. perhaps you will not get improvement. These can have a second operation however.

Dr. Kipp: — I would like to ask Dr. Dench if there were any fatal cases?

Dr. Dench: — No, none that could be attributed to the operation. One died of pneumonia and one of meningitis which existed before the operation.

Dr. Bacon: — I referred to private patients in speaking of fatal complications and made the point that the statistics were different in hospital cases. As I understand it, Dr. Dench's cases are entirely from the dispensary, so that he has not answered the question as to the mortality among private cases.

Dr. Pooley: — I want to make the further statement since hearing Dr. Dench that not long ago a distinguished obstetrician spoke of the danger of meddlesome midwifery and it would seem to me that in the after treatment of these cases meddlesome otology may be as bad. Arnold Knapp, in a series of cases carefully observed, brings this out in a striking manner, and in my experience I find it to be true. Dr. Dench has supported the position I took in the paper referred to. One of the objections too is

that this is not always a radical procedure and is therefore wrongly named. If it doesn't cure then it is not a radical measure. Another point is that it should be done always in cases of cholesteatoma.

Dr. Dench: — As to cholesteatoma, I think it depends upon where it is; if in the tympanic space it can be dealt with thoroughly without the radical operation. In general of course I agree with the doctor.

Dr. Holmes: — I do not know whether or not I have performed as many radical operations as Dr. Dench. I believe I have made eighty or ninety, and my experience has been very much like Dr. Dench's. My teaching was not so very radical under Schwartze, and it was one of the rules that we should always try to cure the case first by treatment and resort to ossiculectomy where other treatment would not answer and as a final resort do the radical operation. I think that is very wise, and for that reason Dr. Blake's paper is a very valuable one, for if from a society of this kind, statements go out encouraging the radical operation, without careful restrictions, the danger probably lies not with the men who are members of this society, but with the younger men of little experience who read these statements, and are apt to be too radical and resort too quickly to the operation without the proper discrimination of men of longer training.

As to the results upon hearing of the radical operation I have tried to make careful tests, but have concluded that it is almost impossible to do so. I have recently had a girl of twelve years that had been treated in Vienna and later referred to me, in which I was particularly anxious to find out if there was any improvement. I used wax to seal one ear, closed the nostrils and mouth, and yet she could hear quite well; I could not eliminate the sounds in any way, and with both ears closed tightly, the nostrils closed and she holding her breath she could still hear well. The hearing tests are not reliable in many of these cases, especially in the young.

In this connection I should like to mention a new remedy, which so far in my hands has given good results. I refer to salubrin which was brought out by P. Hakansson, a Swedish chemist, of the University of Lund, Sweden, and is composed largely of acetic ether. I have the formular, and will later prepare a paper on the subject of its use. Nothing else has ever given me such good results in chronic purulent otitis, *with scanty discharge*, the cases that seem to have resisted everything but an operation. In acute cases it is of no value, nor where there is profuse discharge.

As to the brain complications, I have seen several cases of brain abscess and meningitis secondary to chronic suppurative middle ear disease. It was only recently while in New York that I was present at an Otological meeting and spoke of one of these cases; a medical student who was treated at intervals for a chronic purulent otitis media, but refused an operation. After a sub-acute attack he developed brain symptoms, fever, choked disks, etc. Upon operating I found two abscesses in the brain, death resulting.

With regard to the after treatment, following the operation, last year Dr. Dench and I talked on this subject and I think both of us had come to the conclusion that less violent packing was the best thing. I have had several cases now in which after operation I did nothing but blow in a little aristol, or used the cordine packing, putting it in very loosely. I have had some cases in which no packing in the mastoid was used. Some of the patients do much better than with constant forcible packing day after day, but a certain percentage require firm packing. I have been fortunate until recently in never having injured a facial nerve. Recently while operating I spoke of the success I had had in this respect, and just then I injured the nerve. It was lying loose among the granulations. The patient, however, recovered. That is my first

injury to the facial nerve in all my mastoid operations. I have cured two cases of complete facial paralysis, by the radical operation within ten days after it occurred.

Dr. Kipp:—The conservative treatment has its value especially in the cases of working men and women with otitis media in one ear and deafness in the other. I recall the case of a man who in early infancy had scarlet fever with otitis media in both ears. One dried up, leaving a deaf ear, while the other continued to discharge from a perforation in Schrapnell's membrane. I thought several times of operating, but later succeeded in arresting the discharge. The man has been under my care now for thirty-five years. He would have an attack once in a while, and three times I was on the point of operating, but each time the attack passed away. Five years ago the perforation closed up and it has remained dry since. Now what would have been the result had I operated? I think it is worth while to give these people every chance before resorting to the operation.

Dr. Blake:—In my paper, Mr. President, I made no mention of the hearing; that was an oversight. That must, of course, be taken into consideration in this matter of ossiculectomy. Dr. Kipp's report brings to mind a case of a young woman, a stenographer, dependent upon her right ear. In that case ossiculectomy had been advised, and I advised against it on the ground that the woman had at the time hearing sufficiently good with a perforation through Schrapnell's membrane; she heard the tuning fork 45/60. The case has been taken under treatment, which will be continued as long as she can hear with that ear. When she can no longer hear, and the suppurative process has gone on to destruction of the heads of the bone then will be time enough unless she has some symptoms requiring removal of the ossicles.

With regard to closing this discussion, I should prefer not to close it, but to let it go over to the next meeting,

because it is a subject that you can discuss through several meetings. We have several valuable papers to be read yet and if I continued I should say too much. I should be glad, for one, to keep a careful record of my ossiculectomies and to make a report to the society at the next meeting, if that may be permitted.

REPORT OF A CASE OF SIGMOID SINUS THROMBOSIS; OPERATION WITHOUT LIGATION OF THE INTERNAL JUGULAR VEIN; RECOVERY.

GORHAM BACON, M. D., *New York, N. Y.*

The patient, Sarah H—Irish, 33 years of age, was admitted to my service at the New York Eye and Ear Infirmary on February 13, 1904.

Previous History.—She had measles, scarlet fever, and whooping cough when a child, otherwise she has always been healthy and strong, except for an attack of la grippe, which she had four years ago, followed by acute mastoiditis on the right side. She was under my care at that time and I performed the usual mastoid operation. She has never had any trouble with that ear since and the hearing is good.

The present illness began three weeks ago, when she had another attack of la grippe, followed by a severe and throbbing pain in the left ear and side of the head. Four or five days later there was a discharge, profuse and thick at first, and tinged with blood. Since the discharge began the pains have become less severe, although the patient has never been entirely free from them. She noticed tenderness and a slight swelling behind the ear about ten days ago.

Examination.—Right mastoid shows an old depressed scar from a previous operation. The drumhead is thickened and retracted. Left ear: mastoid tenderness present over the antrum, tip, and on the bone behind the tip. The external auditory canal contains a moderate amount

of thin, purulent discharge. There is sagging of the posterior and upper canal wall. A fair sized perforation is seen in the drumhead posteriorly.

The heart and lungs were examined and found to be normal.

Operation, February 14th.—The usual incision was made behind the auricle down to the bone, while a second one was carried backwards from a point on a line with the external meatus. A perforation was found in the bone. The mastoid cells were thoroughly exposed and found to be filled with pus. The mastoid tip was removed and the sigmoid sinus was exposed for one inch below the knee. It was found covered with granulations, and the bone was removed until a healthy sinus wall was found. In doing this, however, the sinus wall was accidentally injured and a good flow of blood followed.

The antrum was exposed, the posterior incision was sutured, and the wound was packed with iodoform gauze and bandaged. When admitted to the hospital, the patient's temperature was 99.5 F., and the case progressed favorably till February 20th, when the temperature rose to 102 ; pulse 116; respirations 24. On February 21st the temperature was 102.3 at 9 a. m., but fell to normal at 9 p. m. It reached 103.5 at 6 p. m. on February 22nd, and, during the previous night, the patient had considerable pain in the ear and wound. The wound has been dressed frequently and looks very well. The patient has had slight nausea, but no vomiting. February 23rd, 9 a. m., the temperature was 101.5 ; pulse 84; respirations 22. The patient was very restless during the night, and complained of a great deal of pain on the left side of the head. This was relieved by changing the dressings. She had slight nausea at times, but no chills or vomiting.

As the patient was having a septic temperature and as the wound seemed to be in a perfectly healthy condition, I decided to open the sigmoid sinus.

Second Operation, February 24th. The sinus was more fully exposed towards the torcular. The sigmoid sinus was easily compressible and pulsated. After compressing the sinus, above and below, a free incision was made between these two points.

There was a free flow of blood from the upper end, but from the lower end there was no flow until a curette was introduced down to the bulb. Even then the flow was very moderate. No distinct thrombus was seen, but one was evidently forming at the bulb.

The temperature came down to 100 on the day following, but on February 26th it gradually rose to 104°. From that time on, however, the temperature gradually fell till March 1st, when it was normal.

March 4th. The patient was comfortable and took her nourishment well and was gaining steadily.

March 19th. The mastoid wound was granulating nicely. The perforation in the drumhead was closed and the landmarks were reappearing. The patient left the hospital on that date, but was to return for treatment as an out patient.

April 1st. The hearing was the same on each side, about 15 inches for the watch; she heard conversation as well as she ever did. Her recovery has been uneventful.

Remarks. This case seems to me to present several interesting points. In the first place, it is very probable that the infection of the sigmoid sinus was due to the accidental injury of its wall during the mastoid operation, although it is possible that the infection had already reached the sinus in the usual way. Some writers seem to think that it is a matter of small importance whether the sinus is opened during the mastoid operation. This view of the case seems to me to be a dangerous one. In the second place, although there was but a slight flow of blood from the bulbar end, I did not ligate the internal jugular vein in spite of the fact that the temperature reached 104° F. the day following the operation.

If we operate in a case of sinus thrombosis and find that the clot has not broken down, I do not consider that it is at all necessary or even wise to ligate the internal jugular vein, even if we do not get a free flow of blood from the bulbar end.

I have already reported a number of cases where this line of treatment has been successfully followed and I fail to see the necessity in such cases of subjecting a patient to the additional shock of ligating and excising the internal juglar vein.

This patient did not present the usual symptoms of sinus thrombosis, as there was no chill or vomiting. She suffered from sepsis, which was not relieved until the parietal clot in the bulb had been removed with a curette.

DISCUSSION.

Dr. Kipp:—With regard to the diagnosis of sinus thrombosis, I saw sometime ago that some German operator had observed that an undulatory movement was seen in the sinus if the patient swallowed while the sinus was exposed, this being evidence that the sinus was not obstructed. I have not been able to make the patient swallow while the sinus was exposed' but if the observation is confirmed it would certainly be a valuable sign.

Dr. Pooley:—I am heartily in accord with what Dr. Bacon has said. I think the majority of cases of sinus thrombosis come from accidentally wounding the sinus at the first operation. A case of that kind I reported in Washington at our last meeting. Then, too, I believe that under these conditions ligation of the jugular is not absolutely good surgery. In the case referred to, the patient was almost moribund during operation and although there was no flow of blood in the sinus by compression on the neck I could get a flow. I think if the operation of ligation had been done the patient would have died from the prolonged operation.

Dr. Dench:—I had an interesting accident occur in a radical operation sometime ago. In trying to expose the hypotympanic space I remarked to the class that we were in some danger of wounding the jugular bulb. I chipped off a thin layer of bone and went right into the bulb. I packed with iodoform gauze. The bony cavity had been cleared out and I was able by putting the gauze directly over the opening to control the hemorrhage. The only danger was from infection of the sinus. My assistant held the gauze while I grafted the upper part of the cavity with Tiersch grafts. I packed in the usual way, isolating the wounded area with a strip of iodoform gauze and allowed it to remain five days. Then there was no hemorrhage and on the eighth day I grafted the wounded area, sewed up the posterior wound and the man made a good recovery. If we are careful in our technique and clear out the foci of suppuration before exposing the sinus, then if we do wound the sinus accidentally the chances of infection are very small. I should not like to do what Dr. Pooley did, that is manipulate the neck, in a case of that kind. In a similar case I found a clot in the sinus; I put the child to bed for twenty-four hours after the primary operation and the next day removed the jugular. The patient made a good recovery. In that case it would have been impossible to have gone on and excised the jugular, but if you wait until the patient is stronger you can do it. The walls of the vessel were infiltrated with streptococci and any manipulation would have been bad. If you have no free hemorrhage over the lower end of the sinus you should excise the vein.

Dr. Randall:—It seems to me surprising to have the point made that *many* of these cases are from accidental injury to the sinus. I have been so awkward as to injure the sinus I think in six cases, but not with the slightest unfavorable result. I had known of but one previous case on record in this country, and but few abroad, where pyaemic symptoms and thrombus followed the injury.

My impression is that in view of the frequency of injury to the sinus the occurrence of sepsis from this cause is rare.

As to the cases where good results follow without ligation I would again call attention to the fact that they are acute cases. If we have a chronic case with sinus thrombosis, ligation of the jugular is the safer rule in the matter.

Dr. Holmes: — I should like to know the opinion of the members as to continuing the operation after the sinus has been accidentally wounded; would they always go ahead with the operation? I have not opened the sinus, but I have seen it done in Halle and Berlin. The rule was ten years ago that the operation should be stopped and the wound packed and then to wait six or seven days before attempting to finish the operation. Of course, that idea has been abandoned now and you plug the wound and go ahead. I should like to ask Dr. Dench and Dr. Bacon if that is their rule?

Dr. Dench: — In answer to Dr. Holmes' question I should say, simply go ahead of course; I always do. Plug the sinus and go ahead. I remember one case where an assistant went right into the sinus with the second blow of the chisel and in that case there was some difficulty because of the accident happening so early in the operation. I plugged the wound in the sinus and removed the cortex in front and below and got down to the antrum and was then able to expose the wound in the sinus.

Dr. Blake: — Another thing which is possible in many of these cases of injury to the sinus is to make the sinus block itself; ripping away the bone and allowing the brain to press down and close the sinus.

Dr. Jack: — It seems to me that what one is able to do in any individual case depends upon the amount of hemorrhage from the sinus. If the hemorrhage can be controlled and there is left sufficient field for operation the operator may proceed.

Dr. Randall: — I had two cases in marked contrast; one where the sinus was opened at the first touch of the probe and there was a profuse discharge of blood which I controlled by packing. Cautiously removing the plug after completing the other work, I found the wound agglutinated and was able to curette the granulations from the wall of the sinus without disturbing it. In the other, I followed, contrary to my judgment, a rule laid down by many, of enlarging backward the wound when seeking to expose the cerebellum. There I bit off a large mastoid emissary which I was unable to control and the operation had to be stopped. My patient was unrelieved and died a few days later, probably of the cerebellar abscess I had failed to reach.

Dr. Bacon: — I simply reported this case to add it to the list of similar ones already recorded. They were cases following acute otitis media. I have found that, when the thrombus has not already broken down even if you do not get a free flow of blood from the bulbar end, it is not necessary to ligate the internal jugular vein. All the cases I have operated on according to this method have recovered, and I fail to see the necessity of subjecting the patient in such instances to the additional shock of ligation. The latter procedure is a serious operation and adds very much to the gravity of the case. I think we are safe after removing a firm clot to wait twenty-four hours at least. I have seen patients have a chill in the next twenty-four hours after the operation due to absorption, probably, that had already taken place. In a case I recently saw I did ligate and excise the internal jugular vein and found nothing in the vein. The patient died of suppurative meningitis. So that we do not always accomplish the desired end even when we perform the operation of ligation.

As to the point raised by Dr. Holmes of injuring the sinus during operation, I should not stop on that account.

Another point that I made is that it is very important not to injure the sinus in operations on the mastoid. I have seen several cases where I thought infection was due to injury of the sinus wall during operation.

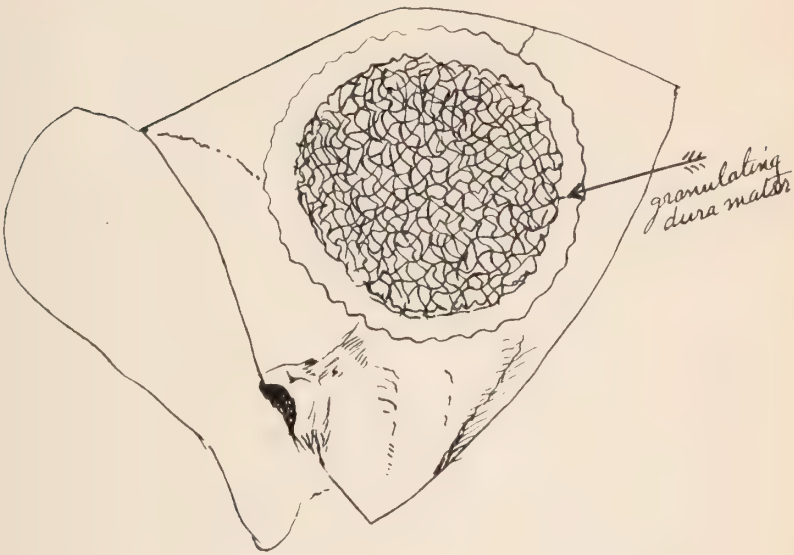
EXHIBITION OF A PATIENT RECOVERED FROM RECENT OPERATION FOR EPIDURAL ABSCESS.

W. Sohier Bryant, M. D., *New York, N. Y.*

The patient, a muscular man of twenty-one, was seen with Dr. Alfred Michaelis three months previous to the operation. He had had "grippe" and earache. Headache commenced a month later. He continued his heavy work till within five weeks of the operation. Sero-purulent discharge not very abundant. No fetor. Not much tenderness behind the ear. No odema. Tympanum filled with inflamed sensitive tissues, which were partially removed.

June 18. Patient showed marked tenderness over base of mastoid process, especially posteriorily, and had continuous severe headache. Temperature 100 ; pulse 88; respiration 20.

The usual mastoid operation was done with the front bent gouge and curette, on June 19. The mastoid cells were filled with granulations which were removed, together with the bony trabeculae and the tip of the process. In the posterior part of the wound profuse venous oozing streaked with pus appeared. The incision in the skin was extended backward forming a T, and the calvarium was found wanting over an area as big as a silver dollar, behind the base of the mastoid process. The space was filled with soft granulations springing from the dura. The opening in the bone was enlarged until a ring of white healthy dura one-quarter of an inch wide showed all around the granulating surface.



The wound was washed clean with warm saline solution and the skin flaps were brought together and stitched, the meatus packed and a moist dressing applied over all. June 20, bandage changed, temperature 99.8°. June 22, temperature 100°, the highest point reached during the convalescence. June 27, temperature remained normal, pulse 84, respiration 20. July 4, external auditory canal dry and in good condition. The membrane was reddened and thickened, some hearing. The wound all healed except a very small sinus at the centre of the incision which led into the antrum. There was a slight discharge of turbid fluid; no fetor. July 8, acoumeter 13 inches. July 10, wound dry and healed. A pit one-quarter of an inch deep at former mouth of sinus. July 12, hearing good; wound healed and solid. Patient has gone back to his usual work.

The short convalescence of the patient can be attributed to the use of the front bent gouge which does not require a mallet for its best work; also to not destroying more of the tissues than were necessarily infected, and to closing the wound after the operation and not disturbing it with packing. Primary union took place except at one point where the sero pus from the middle ear escaped for a few days, because the membrana tympani was allowed to heal at once, which was a mistake. The patient was perfectly comfortable after the operation except for two days of stiff neck. He had no pain, tinnitus or vertigo after the operation.

DISCUSSION.

DR. BACON: — Is there a small sinus there now?

DR. BRYANT: — A small one, about an eighth of an inch, but without any discharge.

DR. BACON: — I wish I could be enthusiastic about this method. I have tried to be and in some cases it has worked well, but it seems to me there is a good deal of lottery about it. There is always a danger of reinfection and I have had to open the wound again in several instances. I tried last winter to get healing under a blood clot and thought I had succeeded, but the patient came in subsequently with a discharge from the ear as the clot had broken down. I think where there are very few cells involved and not a severe infection there is perhaps a better chance.

DR. JACK: — My experience with the method of healing by blood clot (although confined to a few cases only) has been similar to Dr. Bacon's. When Dr. Blake proposed this method I was quick to try it. In my cases considerable pus was evacuated and the wound thoroughly cleansed after removing all diseased parts. The clots broke down, however, and subsequently the wound had to be curetted out. In a number of cases a second opera-

tion was necessary. I cannot understand why the majority of cases where pus is found do not break down. In a case of exposure of the dura I should wait until it was covered with granulations before leaving a blood clot in the wound and stitching it up. Favorable results have been obtained and I am sorry that personally I have had unpleasant experiences for every one must recognize that this method gives very rapid healing with a minimum amount of deformity. Open wounds heal practically by blood clot, but when the wound is closed there can be no drainage and the clot is likely to break down.

Dr. Dench: — I should like to ask Dr. Blake how infection through the Eustachian tube is prevented in these cases?

Dr. Blake: — That, of course, is one of the means of reinfection and breaking down of the clot. As Dr. Jack says you get the formation of osteoblasts from the thin covering of blood. In many cases in experimenting I have packed in the ordinary way and then curetted the granulations and got a blood clot on top of that which hastened healing. The whole thing consists in the technique; it must be most thorough. Every single cell must come out and you must cut down to sound tissue; you must be able to see white bone and sound tissue.

Dr. Woods: — I have had some experience with Dr. Blake's method, and if one has a good result he is much tempted to try it again. Two cases of recent date occur to me on the moment. In one there was, after ten days, firm healing throughout the wound. In the other a small area of the clot toward the bottom of the wound, broke down. The healed portion was left undisturbed, and granulations sprung up from this and closed the wound in three weeks. If I may judge from my limited experience, the essential of success is thorough cleaning out of the operative field — removal of all vestige of granulation tissue or impaired bone. The "lottery" to which

Dr. Bacon has alluded seems to me to be the chance of reinfection, probably from the Eustachian.

I should like to ask Dr. Blake what he does with these cases of partial disorganization of the clot. Of course when, as sometimes happens, the entire clot disorganizes, one must pack as if he had done so from the beginning; but in some cases, as in that narrated, a large portion holds. Would Dr. Blake in such a case break up the whole clot or simply work upon the disorganized portion?

Dr. Blake:—In answer to Dr. Woods' question as to partial disorganization of the clot, I am guided in my treatment of that condition by the nature of each individual case. In some cases I wash out, and in some I rip the clot from top to bottom. When I first began my investigations I used to rip the clot from top to bottom on the second day to see what was going on and partly because I felt that I must establish free drainage. The result was that often the periphery of the clot would stay firm and I would pack into the middle of the clot. I have found superficial breaking down and after the fifth or sixth day I have stimulated the broken down area just as I would with granulation tissue, using iodin in ether. Where a sinus formed notwithstanding, I cleaned out and treated as I would a sinus anywhere else.

Dr. Bacon:—I should like to ask Dr. Blake if he thinks the danger from the middle ear is greater than that from the Eustachian tube, and how he gets rid of the germs in the middle ear?

Dr. Blake:—In the radical operation I have generally split the canal and carried that back, closing in the antrum in that way; allowing the wound to fill in and close up and carrying out the remaining treatment through the canal. In the acute cases I simply endeavor to get the middle ear as clean as possible and then do the mastoid operation and close up.

In this case of Dr. Bryant's I should like to ask the condition of the antrum.

Dr. Bryant: — The condition was good but in the posterior part there were granulations.

Dr. Blake: — Infection from the middle ear is of course the danger and we always try to clean out the middle ear thoroughly. I think the thorough cleansing of the middle ear in these cases is the important thing. It must be thoroughly done by operation or otherwise. I have used the blood clot after an ossiculectomy. I have tried allowing the middle ear to fill up with clot and then packing down on it with cotton dipped in $\frac{1}{2000}$ bichlorid.

Dr. Bacon: — I meant in acute cases, where there is a free flow of pus from the canal, say of ten days' duration. I understand the doctor uses the blood clot there. How does he clean out the middle ear?

Dr. Blake: — In these acute cases I always make a crescentic cut, beginning about the level of the round window and making an opening to afford the very best drainage; clean out the mastoid and allow it to fill in with blood clot and you get the drainage from the clot. There is drainage from it from the moment it begins to shrink.

Dr. Reik: — I did not have the pleasure of hearing the paper, but since the discussion has taken the trend of considering the blood clot method, I should like to say a word. My personal experience has been, considering that we see in Baltimore a relatively small number of these cases, rather wide and most gratifying. I have used the method in all sorts of cases, acute mastoid trouble and radical exenterations, and with great satisfaction. In only a few instances has the clot broken down. When I first reported a few cases at home there was some criticism of the method and the question was raised of whether it was not dangerous because of the possibility of blocking up some purulent secretion there and having a focus of disturbance. I consulted an eminent authority on this subject, Dr. Halsted, who was probably the first to use the blood-clot method in his excellent work in the treatment of osteomyelitis of the tibia. He said he could not con-

ceive of there being any danger in closing the mastoid wound in this way: that even if one did not succeed in getting all that Dr. Blake aims at and left some active secretion behind, the clot would break down and he would simply be in the position in a few days that he would have been in had the wound been packed originally.

Dr. Dench: — What Dr. Reik has just said is exactly to the point. I read Dr. Halsted's paper when it came out, but the conditions are not exactly the same in the mastoid operation as in the operations upon the long bones of the body, because in an operation on the tibia, for instance, you fill up the cavity in the bone, suture the soft parts and there is no danger of a reinfection, but in the mastoid, as Dr. Bacon has pointed out, you may get a reinfection from the middle ear through the Eustachian tube and that is why I think the good results are wonderful. I have discussed the possibility of blocking the aditus ad antrum with some sterile tissue. Without that I cannot see why, as Dr. Bacon has said, it is not largely in the nature of a lottery.

Dr. Randall: — I, too, have been disappointed in the results, but have also gotten very good ones. The study which I made many years ago of the subject of healing in arteries after ligation was an effort to discriminate between the two forms of healing — one which ascribed the organization to the clot, and the other which gave all credit to the cells of the intima. My studies satisfied me that we had both elements in the case — that the blood-clot offered an element of positive value in the constructive process of repair, and I do not see why we should not have more than a merely sterile medium for a packing in our mastoid operations, but a material that actively contributes to the process of repair.

Dr. Bryant: — The indications in this case were, I think, very clear and the result confirmed them. The patient was in good condition; his temperature was not

high at any time, and he was able to do heavy work to within a short time of the operation. After the operation was completed, a clean wound remained containing no infected tissue. The only possible source of infection was from the tympanum in front. As to Dr. Jack's remark about covering up the dura, it can be said that it was already covered with what we considered healthy granulations, and we did not see anything to do but let them join with the new granulations, and thus obliterate the wound cavity. Of course there is always danger from the front, and on that acoount we try to dress the middle ear quite often, and we begin very shortly after the operation. In doing this the greatest care in preserving asepsis must be used. In this case the meatus was opened on the second day, and examined. No pus was found and the ear was filled with boracic acid and closed. After which it was cleaned every day, wiping it with sterile cotton wipes, and insufflating sterile boric acid. In this way it was quite possible to keep the wound practically aseptic.

A FATAL CASE OF PURULENT INFLAMMATION OF THE MIDDLE EAR; CARIES AND NECROSIS OF TEMPORAL BONE; SUPPURATION OF LABYRINTH; PLASTIC PACHYMENINGITIS INTERNA AND PURULENT LEPTOMENINGITIS. WITH TEMPERATURE CHART.

CHARLES J. KIPP, M. D., *Newark, N. J.*

The patient from whom this specimen was removed was a man 32 years of age. I saw him for the first time twenty years before his death and treated him for chronic purulent inflammation of left middle ear following an attack of scarlet fever. He was at that time under my care for many months, and when I ceased attendance the otorrhoea had ceased, and his hearing, which was almost totally destroyed when he came to me had greatly improved. During the following twenty years he was free from pain and the ear remained dry. About a month before his death he was attacked by vertigo for which he consulted a physician who prescribed a medicine for him. Two weeks later the left ear began to discharge again and he had so much pain in and around the ear and in the left side of the head, that the physician was obliged to give him morphine repeatedly to relieve the pain. On the 7th of October, 1902, his pain was so great that his family thought he would become deranged, and had him removed to the hospital. The attending surgeon, Dr. Francis, requested me to see him and to operate on him if necessary. I found a pretty well developed man, whose countenance indicated great suffering. He told me that he was suffering from most intense pain over the

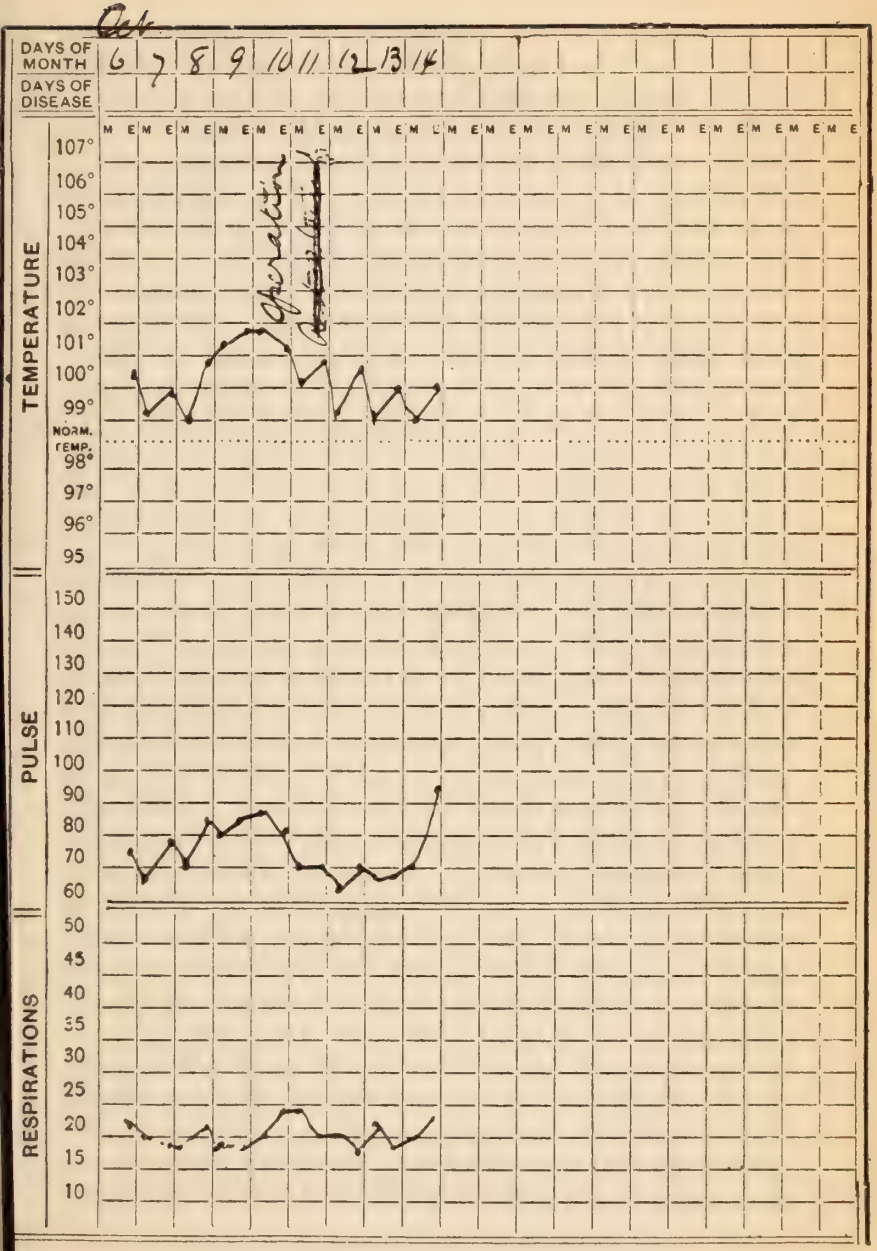
whole left side of his head and in the ear. Temperature $100\frac{4}{10}$, P. 76. There was no evidence of disease of chest or abdomen. On examining the left ear I found the external canal almost completely filled by a polypus. The growth was bathed in very offensive pus. There was no tenderness or redness or swelling over the mastoid process. He was totally deaf in this ear. Tuning forks placed on vertex were heard only in right ear. He was suffering from vertigo and found it difficult to walk without assistance. He had slight facial paralysis of left side. He fainted during my examination and an ophthalmoscopic examination made while he was in the faint showed the eyegrounds very anemic, but otherwise normal. The nose and pharynx were normal. Temperature $101\frac{5}{10}$. I made the diagnosis of disease of labyrinth and perhaps meningitis.

Next day the patient was put under ether. The polypus in the external meatus was removed by snare. I made the usual operation for opening the mastoid antrum and found the cortex very hard. I exposed the sigmoid sinus and the dura mater of the middle fossa and soon found myself in a large cavity filled with granulations. After a careful removal of these with sharp spoon, I found that the disease had produced a cavity in shape very much like that made in the so-called radical operation. The inner half of posterior wall of external canal was gone; the anterior wall of the attic was absent; the antrum enormously enlarged and communicating freely with the tympanic cavity. The horizontal semicircular canal was of dark color, and pus escaped from a small fistula in the same. On removal of the granulation in the tympanic cavity I found that the promontory was absent, and that pus was coming out of the deficiency. The stapes was absent. I enlarged the fistula in the horizontal semicircular canal, and as drainage from the labyrinth was apparently free, did nothing more. The wound was packed in the usual way, and the

patient put to bed in good condition. On the following day the facial paralysis was more marked. He had less pain in head, although he still required morphin to make him sleep. Temperature 100⅕. Next day the wound was dressed and was found to be clean, — no pus anywhere, but a foul odor from depth of wound. Morning temperature 99. Evening temperature 100⅕. Pain in head continued. Next day the patient became very restless, was delirious at times, got out of bed and tore off bandages. Morning temperature 99. Evening temperature 100. On the fourth day after the operation he failed rapidly, and died in the afternoon. Temperature did not rise above 100.

The autopsy made on the day following his death was made by Dr. Mercedes, the pathologist of the hospital, to whom I am indebted for the following notes and the specimen:

Operation wound into mastoid: the dura exposed in both parietal and occipital fossa. Gangrene of soft tissue bordering around the opening into cranial cavity. Lower portion of mastoid cells free from disease. Upon removing calvarium escape of dark fluid blood mixed with small quantity of sero-purulent fluid. Congestion of blood vessels over vertex. Along line of blood vessels all over surface vertex and base light deposits of lymph and turbid fluid in subarachnoid space. Lining left half of occipital fossa is a layer of chamois-like lymph. The cerebellum and medulla in contact with this are but slightly more involved superficially than the rest of the brain, but between the medulla and the cerebellum is a collection of grayish pus and debris. The surfaces of medulla and cerebellum are here somewhat superficially destroyed,— the 7th, 8th, 9th and 10th nerves involved apparently in this destroyed area. Sections of cerebellum elsewhere and of cerebrum are normal. The mastoid cells, occipital fossa lined with layer of exudation and


Oct
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DAYS OF DISEASE
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103°
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NORM. TEMP.
98°
97°
96°
95
Operation
PULSE
150
140
130
120
110
100
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80
70
60
RESPIRATIONS
50
45
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35
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25
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15
10

abscess being in direct continuity, it would seem that the infection traveled from without inward.

The abscess here mentioned by the pathologist was not really an abscess in the usual sense, but a large collection of pus in the pia, pressing on and eroding the surface of the cerebellum. The lateral sinus as well as the superior and inferior petrosal sinuses contained fresh soft clots, but no evidence of inflammation. The examination of the polypus removed from the external canal showed it to be composed of granulation tissue in which was imbedded a mass of cotton threads and several small sequestra, which were undoubtedly parts of the promontory. The specimen which I here show you will need no further description from me, but I wish to point out to you that the posterior surface of the petrous bone, although this bone has been in the solution of formalin for some time, shows no evidence of disease, not even a discoloration, and the surface of the dura in contact with it is perfectly smooth and glistening; its other surface is covered by a thick layer of lymph. This hyperplastic pachymeningitis interna I have never seen in connection with purulent leptomeningitis, and my efforts, aided by men better versed in pathology, have failed to find a connecting link between the two very dissimilar conditions. The bone, as you will see, has been broken off near the apex of the petrous portion and the externa auditory canal has been thus opened. There was pus in this canal, as well as in the cochlea, vestibule and the semicircular canals, and in the absence of any fistula in the dura communicating with the bone, and the absence of visible change in the aquductus vestibuli, I think it probable that this meningitis was caused by an infection travelling through the internal auditory canal. The hyperplastic pachymeningitis interna appears to have been of longer existence than the leptomeningitis. Whether it is in any way responsible for the development of the latter, I have been unable to discover. No bacteriological exam-

ination was made. Microscopically the exudation did not differ from the ordinary form of hemorrhagic pachymeningitis interna.

This is the only case in my experience in which both a hyperplastic pachymeningitis interna and a purulent leptomeningitis were present at same time, and my search for similar cases in the literature has failed to bring any such to light. Cases in which a plastic pachymeningitis interna were found in connection with purulent otitis media are mentioned by Grunert (Archive für Ohrenheilkunde, Bd. 57, p. 35) and Alexander (Monatsschrift f. Ohrenheilkunde, Bd. XXXVII, No. 3, p. 105). In both of these cases there was found a thrombophlebitis of the sigmoid sinus. In Gruert's case the arachnoid of same side was somewhat hazy, but there were no signs of purulent leptomeningitis anywhere. The lumbar puncture showed clear cerebrospinal fluid without increased cellular elements.

In Alexander's case the arachnoid and pia were perfectly normal.

DISCUSSION.

Dr. Randall: — The occurrence of these complications is a matter of great importance and an understanding of their etiology is necessary if we are to make any headway in treating them. I can refer the doctor to one case somewhat parallel that I brought before the society ten years ago at one of our Washington meetings. The specimen figured in my article on diseases of the ear in children in Starr's book and elsewhere. The report of the case is, I think, to be found in our own transactions. There was marked pachymeningitis with granulations dipping down between the openings in the carious tegmen, but no evidence of infection here: the marked plastic exudate over pons and medulla was in connection with a purulent labyrinth and internal meatus.

Dr. Dench: — When had Dr. Kipp seen the ear before?

Dr. Kipp: — Twenty years ago.

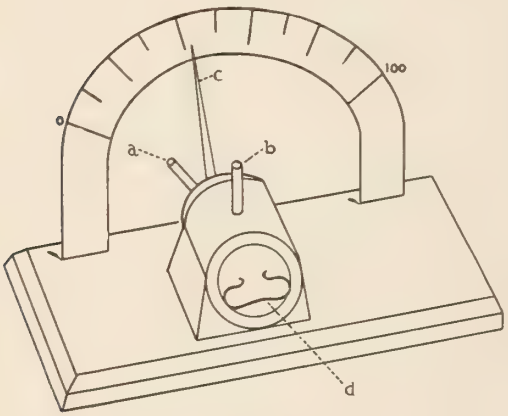
Dr. Dench: — It seems to me that is a strong commentary on the radical treatment of these conditions. It is a case of this kind that we think we have cured that subsequently has an issue of this kind. That is why I advocate the radical operation.

DEMONSTRATION OF INSTRUMENTS. A PHONOGRAPHIC ACUMETER.

W. Sohier Bryant, M. D., *New York, N. Y.*

An Edison standard phonograph is placed in a soundproof box. The sound is led from the phonograph out through the box, and then passed through a stopcock,

Fig. 1.



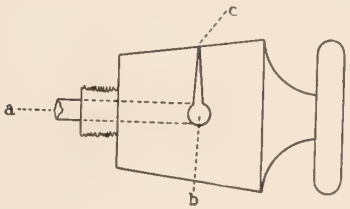
STOPCOCK AND DIAL.

a. Inlet. *b.* Outlet. *c.* Indicator needle. *d.* Plug.

especially constructed for the gradual diminution of the sound down to zero, at the will of the operator. The stopcock has a dial indicating the amount of hearing of the

patient, or inversely, the amount of sound passing the cock. The scale of the dial is divided into 100 degrees. Absolute deafness is 0, and normal hearing for adults ranges between 75 and 80. The cock has an end inlet and side outlet. The plug of the cock rotates, carrying the needle of the dial. The sound is gradually diminished by a tapering groove extending on the surface of the plug for 90°. The base of the groove opens out of the side outlet in the plug.

FIG. 2.



PLUG OF STOPCOCK.

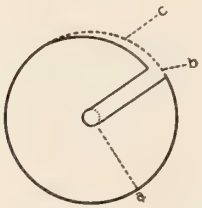
b. Outlet from plug. *c*. Groove for graduating the sound.

After leaving the stopcock, the sound is conveyed in a rubber tube to a 4-way valve with one inlet and three outlets. Two of the outlets can be closed or opened simultaneously or alternately, and are fitted with rubber tubes which in turn are attached to the arms of a stethoscope, and the stethoscope is placed in the ears of the patient to be tested. By manipulating the 4-way valve, the sound is admitted to either or both or neither ear of the patient, enabling the operator to test the ears together or separately, and to detect malingering. The third of the three outlets in the 4-way valve is fitted with a rubber tube for the use of the operator, by which he can hear the sounds that reach the patient. The cylinder of the phono-

graph is indefinitely reproducible when made from a master record. The words used are simple monosyllables in common use.

The device furnishes an unvarying test of the hearing for the human voice. The mechanical voice which the

Fig. 3.



X. Section of plug through its outlet and groove.

machine furnishes, is always reproducible with the same intensity and pitch, and the number of instruments may be multiplied indefinitely. It also allows test of hearing for the voice in a confined space. It gives a good method of detecting feigned unilateral deafness by the action of the 4-way valve.

EXHIBITION OF INSTRUMENTS. THE FRONT BENT GOUGE, ADAPTED TO BONE SURGERY.

W. Sohier Bryant, M. D., *New York, N. Y.*

This gouge is very different from the straight or gradually curved gouge in common use, for it has a long handle and a short sharp curve forward near the tip of the handle, close to the cutting edge, and it has a much wider range of usefulness. It can be used with or without a mallet, on the surface of the skull for trepanning, or deep within an osseous wound for removing a difficultly accessible bit of bone. When the instrument is used as a lever, its convex surface resting on the bony wall, which serves as a fulcrum, great accuracy is developed, enabling the operator to remove the bone with precision. In order to make an opening in the outer table of the Caliverium, the instrument is rotated, the handle describing a larger arc than the blade. This arc is increased in diameter as the excavation increases in size.

The advantages of the instrument are:

I. Accuracy, which allows bolder operating among delicate structures, and diminishes the number of operative accidents.

II. Doing away with blows of the hammer on the skull, which assists the convalescence, and lessens the shock of the operation.

ALPHABETICAL INDEX

—OF—

OTOLOGICAL BIBLIOGRAPHY, FROM JUNE 1, 1903 TO JUNE 1, 1904.

COMPILED BY

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AND

BARTON H. POTTS, M. D., PHILADELPHIA, PA.

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